



Dieta

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A black and white photograph of a rugged coastline. In the foreground, a large, dark, craggy rock formation dominates the right side. A small, dark boat is visible in the water near the base of the rocks. In the background, a small, white, cylindrical lighthouse sits on a distant, flat-topped rock in the sea. The sky is filled with soft, white clouds, and the water shows gentle ripples. The overall scene is serene and somewhat desolate.

Haytime in Wharfedale
(Ex-Royal Society of British Artists 1900)

Photography: Allen J. Co.

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BRITISH TREES

DRAWN AND DESCRIBED
BY
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TEXT REVISED BY DOROTHY KEMPE

IN TWO VOLUMES
CONTAINING 430 REPRODUCTIONS
OF ORIGINAL DRAWINGS AND
PAINTINGS BY THE AUTHOR

WITH A PHOTOGRAVURE FRONTISPIECE

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BOTANICAL
GARDEN

FOR GENERAL INDEX SEE END OF VOL. II.

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PREFACE.

"Every object which pleases must give us pleasure upon some certain principles; but as the objects of pleasure are almost infinite, so their principles vary without end, and every man finds them out, not by felicity or successful hazard, but by care and sagacity."—SIR JOSHUA REYNOLDS.

THE life-history of a tree is to my mind full of interest, and the marvel of its growth from seed to sapling, and so on to maturity, an absorbing study. Every year the passing seasons bring fresh matter for wonder and admiration in the unfolding of leaf, flower and bud, as each in its turn displays a perfect construction, and gives a new aspect to the whole tree. Then too, trees of different species exhibit infinite variety in their habits of growth: the individuality of the one lies in the complete development of all its parts; another, starting with the same equipment, fails year by year to bring all to perfection, and turns failure to account in the development of distinctive features. Take for example the ash and the sycamore, where the buds are found in the same position on the twig, but the resulting ramification is quite dissimilar. Far smaller matters than the architecture of the branches are also of importance in contributing to the character of a tree. The thickness, the texture of the leaf call for attention, once it is realised that they have an even greater influence than its colour upon the general foliage effect. The transparency of the young beech leaf lends brilliancy to its colouring in the spring; an unusually glossy texture gives it a highly reflective surface when it is seen from certain points of view. Again, the manner in which the leaves and petioles of the sycamore are set upon the shoot accounts for the sharp, dark shadows of its foliage, shadows which would never appear on the foliage of a poplar or birch.

PREFACE.

By careful drawings of one whole tree in each species, and of its many parts separately, as they differ in the various stages of growth, or with the seasons of the year, I have attempted to show the beauty and interest to be found in forest trees. Few people have time and opportunity to study these from nature for themselves, and existing books are either purely botanical or so incomplete as to be of little use to the true student.

The object of the letterpress is to explain the growth of the tree in so far as it affects its external appearance, and to draw attention to facts which any careful observer can verify for himself.

Botanical terms and methods of classification are continually changing, neither are they of much service in dealing with tree-forms; for these reasons they are not employed in the present work.

I am indebted to my wife for many observations, and to Miss Dorothy Kempe for re-modelling my sentences to the form in which they now appear.

NOTE.

THIS work is planned as a book of reference for artists and designers, and is intended to give the landscape student assistance of the same kind as is supplied by works on the anatomy of the human form in the other branch of art.

It may also give pleasure to the lover of trees who desires a more accurate knowledge of their growth and character.

All the illustrations are fac-simile reproductions of drawings by the author.



THE ASH.

GENERAL REMARKS.



IN a young tree the constant features that differentiate its species are clearly marked. In old trees the branches become all alike rugged and distorted and much individuality is lost.

This is especially the case where the beauty of the young tree lies in its slender and delicate form. On the other hand, with such trees as the oak and the alder, time and the stress of weather, by accentuating their gnarled and angular growth, give them a new picturesqueness in their old age.



A PENDENT BRANCH.

The sapling of the ash has a simple line of stem, and the soft colour of its smooth, round branches, few in number though they are, makes it attractive in appearance. When full grown the boughs form long sweeping curves, and are seen in clear outline, between regular leaf-patterns, against the sky. At this stage the lower boughs become pendent and bear clusters of delicate foliage. The whole tree gives one an impression of exquisite poise.

With old age the boughs become stiff and lose their grace ; the twigs are stunted, knotted and clumsy ; the leaves come in closer tufts and the foliage patterns are spoilt, while the loss of a single branch is enough to destroy the perfect proportion of earlier days.

RAMIFICATION.

The lines formed by the stem and branches of an ash are fine in their simplicity. At no great distance from the ground the main stem, hitherto evenly rounded, divides into two. One of these subordinate stems becomes of so much more importance than the other that it has all the effect of being a prolongation, in a slightly divergent direction, of the main stem, while its fellow appears to be no more than a lateral bough springing from it. These two stems diverge at rather more than half a right angle, and continue upwards, at an even thickness, until, in their turn, they divide into two, a main bough and a subordinate. All the new branches are formed on the same simple plan, and the long double curves which result from it are one of the chief features of the tree ; the subordinate branches often fall away, which increases the apparent length of the main branch. The lower boughs become pendent and give off lesser shoots, which grow in an upright direction, and in





From *Woods*, 1845.

AN OLD ASH.

which the double curve is again repeated, while yet another set of twigs, developed from buds on the under side, are pendent from these.

The causes of this mode of growth can be traced in the formation of a young shoot or sapling. The shoot which represents one season's growth terminates in a bud; immediately below this are a pair of buds, either opposite or arranged one slightly below the other. At intervals along the shoot grow other pairs of buds, each one at right angles to the pair above it. Next year, the growth of the shoot is not continued from the terminal bud (as in the case of the sycamore where the buds are similarly arranged): this dies away, and from one of the lateral buds springs a new shoot which takes the place of the old. Sometimes, through several successive seasons, the bud is always developed on the same side of the twig, which thus continues to diverge from the straight line in a series of undulating curves. On the other hand, if the buds develop in successive seasons on alternate sides of the twig, a line of alternating curves is produced. Occasionally both the lateral buds produce branches, but one is then smaller than the other, and the curving line is still apparent. A leading shoot produces several pairs of lateral branches in a year, and late in the season the portion of stem intervening between these branches has all the appearance of having sprung from a terminal bud, though this is but rarely the case.

The lower portion of the trunk in the full-grown tree is an exception to its usual formation, being perfectly straight, but this has been brought about by the rapid growth of the sapling. The new twigs spring from the shoot in a curved line, and so the angle between them is not so sharp as in the beech or birch, where the converging lines are straight.

The form of an ash twig is peculiar. The stem projects on either side at the point where the leaf-stalk is articulated with it,

and these projections form as it were brackets, on which the buds rest. Between each pair of brackets the stem is flattened, above and below them it is rounded, and the succeeding flat portions do not exactly correspond in position but are set alternately at right angles to one another.

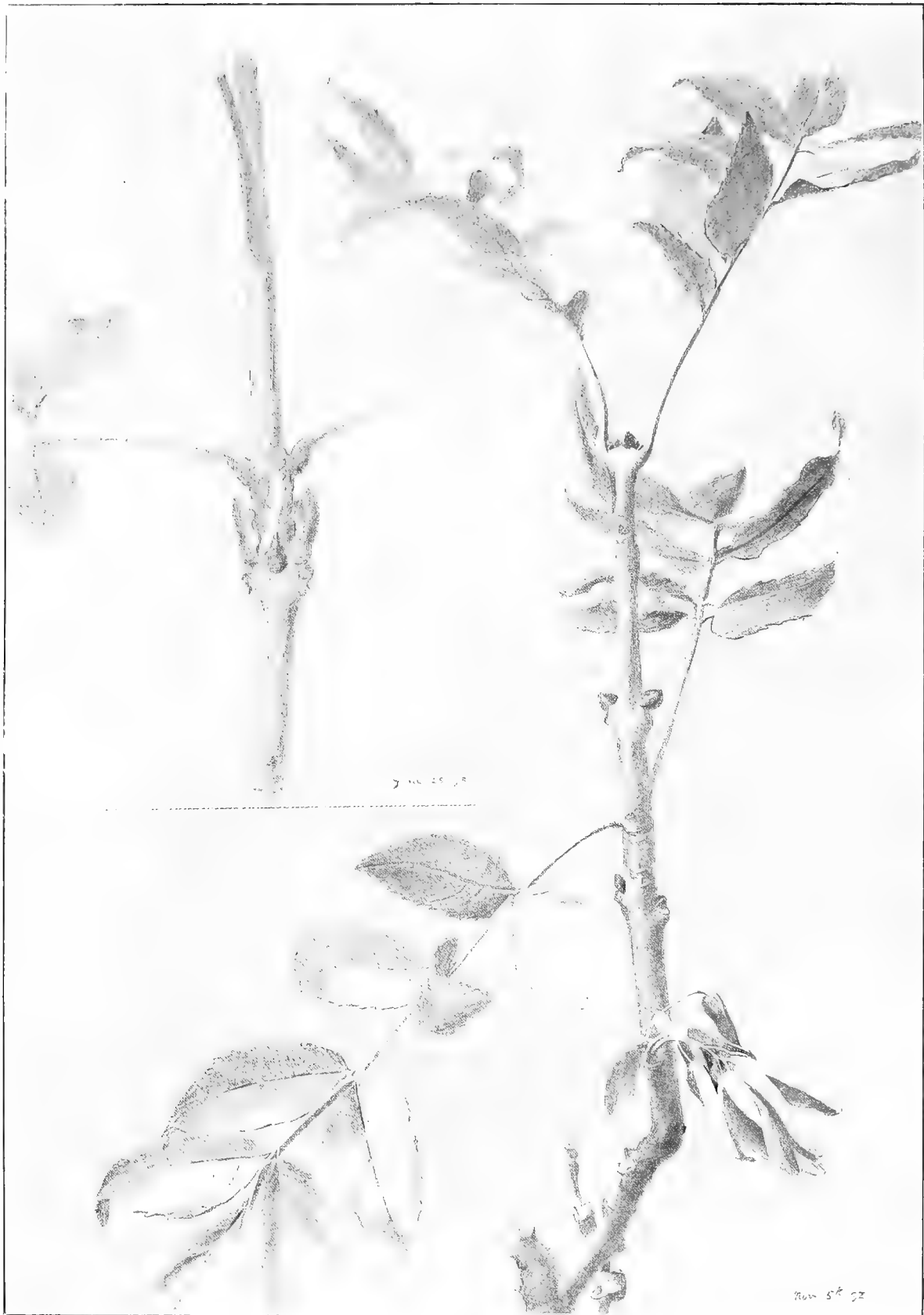
The newly formed shoots are green and very smooth, later on they become a lighter grey-green. The seams that mark the position of former leaves or flowers, or the points from which shoots have sprung, remain as distinct projections on the smooth branches. On an old tree these ridges are found very close together, owing to its slower growth after maturity, and the shorter spaces that intervene between the leaves it puts forth.



THE LEAF DEVELOPMENT FROM THE BUD—IN THREE STAGES.

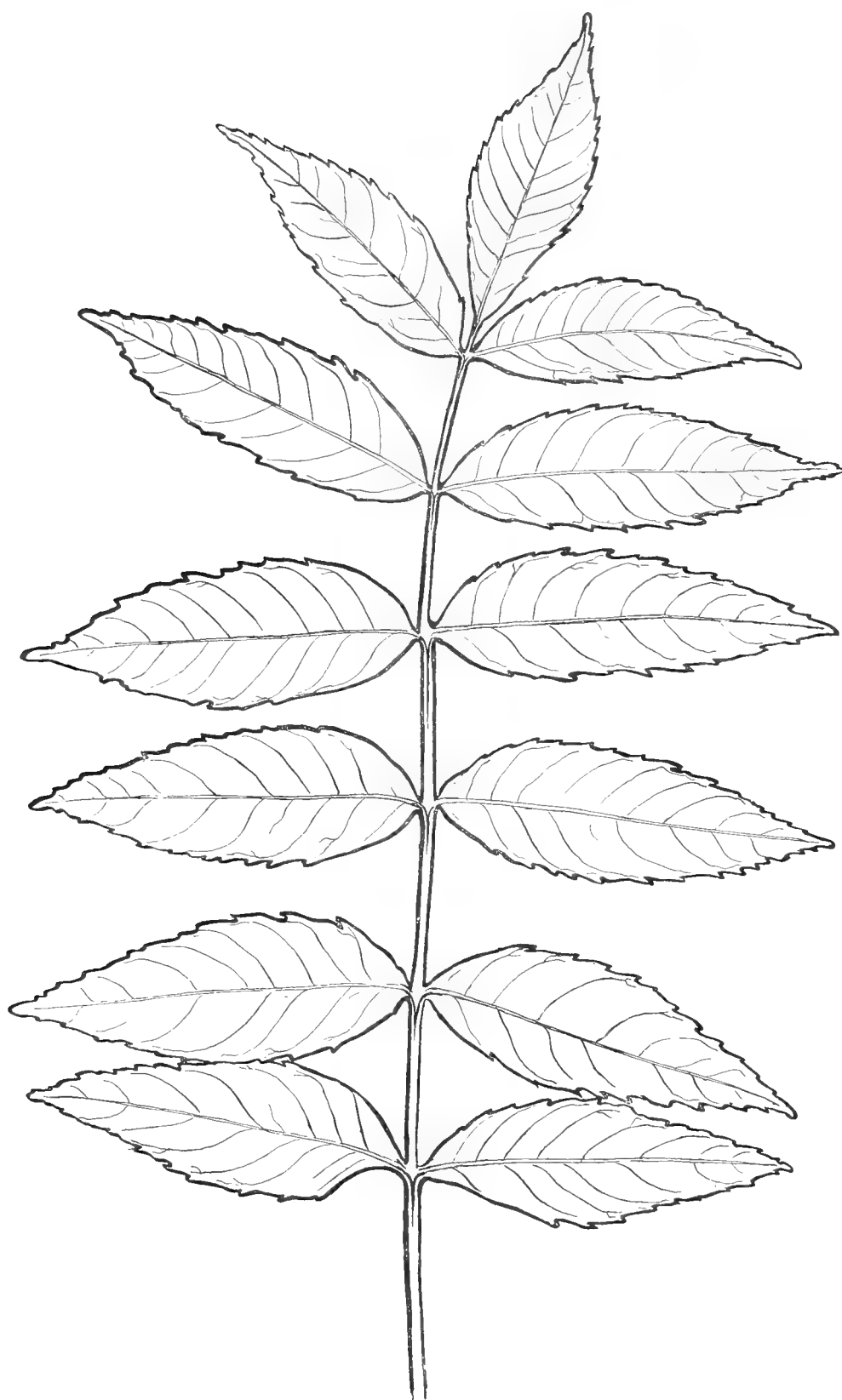
THE LEAF AND PETIOLE.

Ash buds in winter are covered by black mealy scales, very rough in texture. When these burst, they disclose the leaves, folded at the ribs and covered with brown downy hairs, and also a pair of dull green bud scales, rough to the touch and covered with a



THE NEW SHOOT. IN SPRING, AND AUTUMN.





PLAN OF LEAF.

brown felt-like padding. The leaves at first touch each other at the tips; gradually they separate and the leaflets expand, until the whole tree is covered with a curtain of bright green foliage. The young leaves at first point upwards, and only gradually assume a horizontal position: when fully developed each is about ten inches in length.

Each leaf is made up of a terminal leaflet, and four to six opposite leaflets, lying in the same plane with one another. Both upper and under surfaces of the leaflet are smooth and dull, the upper side somewhat greyish-green in colour, the under side much paler. Tiny hairs grow on the under side near the base and follow the line of the ribs. The form of the buds and the leaves is shown in the drawing. Sometimes, from the same point on the leaf-stem as the lowest pair of leaflets, there springs a secondary and smaller pair, but as a rule the space between the couples is regularly equal to half the length of the leaflet.

The mid-rib which bears the leaflets is a continuation of the leaf-stalk, and like it pale yellow in colour and of a very light and glossy surface on the under side. Where the leaf-stalk joins the main stem it is swollen and darker in colour. The under surface of the leaf-stalk is rounded, the upper surface is flat and presents a curious feature at the point of its junction with the leaflet ribs. At that point its outer edges separate and diverge to right and left as it were to give off the subordinate ribs: they then close together again, thus forming a diamond-shaped hollow between the leaflet stems.

The foliage of the ash does not grow in sufficiently dense masses for its colouring to hold its own when seen against the sky. It has no depth of tone and appears greyish in tint. When the wind blows the lower surface of the leaf-stalks, pale yellow and shining, becomes visible and a new effect of colour is produced. The leaves do not

reach perfection till late in the spring and fall early in the autumn, while still green, or only somewhat shrivelled. Occasionally they turn bright yellow. The leaflets often fall before the leaf-stalks.



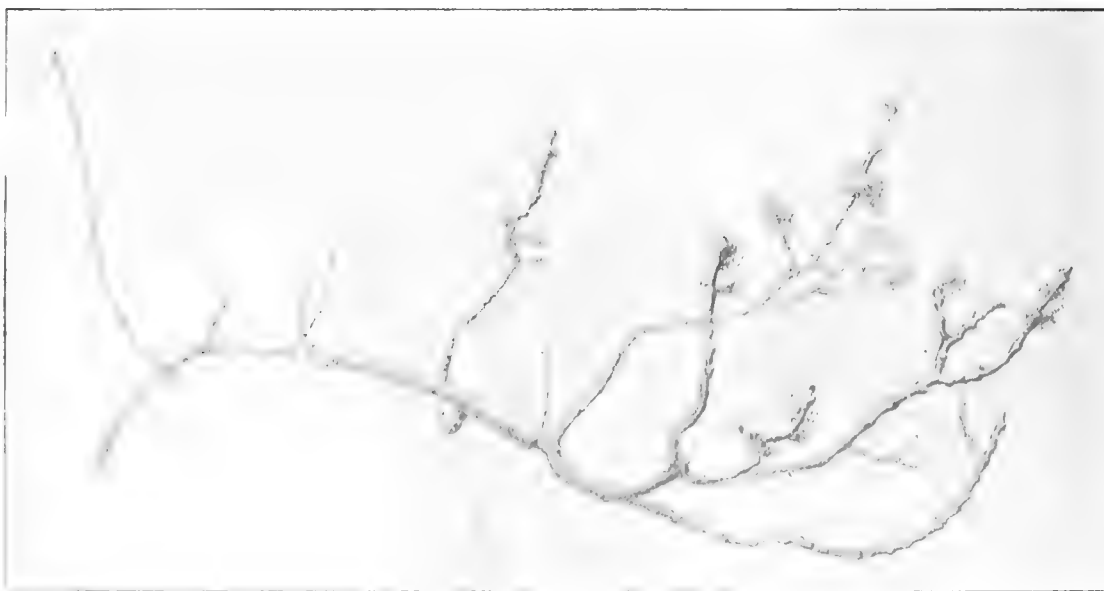
SPRAY WITH FRUITS.

THE FLOWER AND SEED.

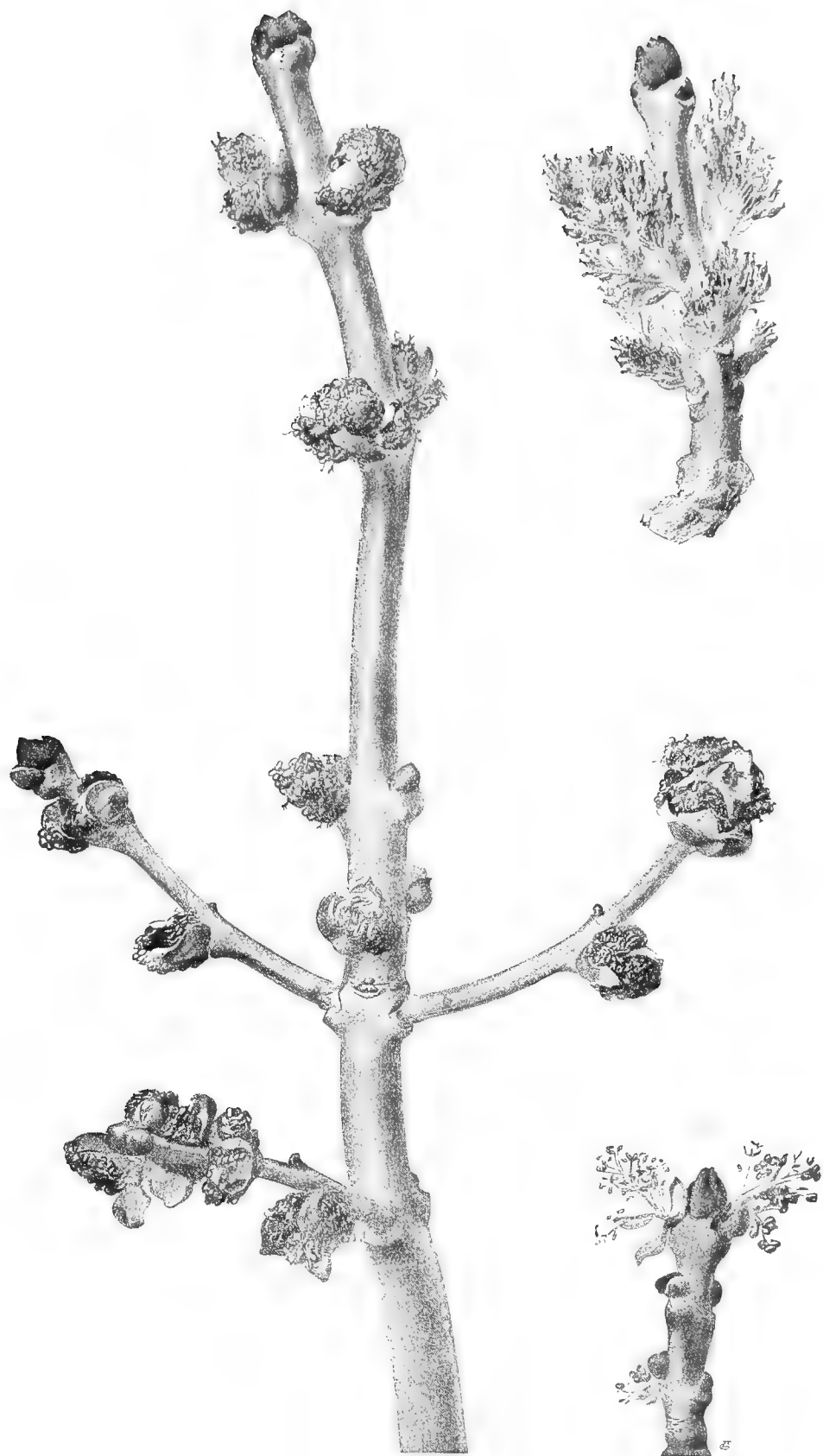
About a month before the leaves are produced, the flowers appear in dense clusters of black or purple issuing from buds on the shoots formed last year. They have neither petals or sepals, but consist of a pistil and a pair of stamens; sometimes the pistils and stamens are found on different flowers. By the time the leaf-buds burst, the barren flowers have become brown and shrivelled, while the fertile ones are forming gradually into small flat green fruits, borne on pale-green stalks. One stout stalk

growing from the twig, divides near the base into two or three thinner ones; these in their turn sub-divide, droop, and bear, on sides and extremities, the still more slender stalks which carry the fruits. Each fruit grows out on one side into a flat wing; and this wing is the first part to change colour in the autumn, when from green it becomes brown. The winged fruits or "keys" are twisted on their axes like the propeller of a boat and the wind carries them spinning through the air to some distance. The bunches of "keys" always remain on the tree late in the year, and the stalks and even the fruits are often found still in their places the following spring.

Although the branches can be trimmed to form a kind of fence, the Ash is an unsuitable tree for growth in the hedgerow, as the roots with their numerous fibres are spread horizontally near the surface of the ground.



BRANCH IN FLOWER.



FLOWER-BUDS AND FLOWER.



ASH "KEYS" AND BUDS IN WINTER.

ASH. *FRAXINUS EXCELSIOR*.STRUCTURE OF THE FLOWER AND SEED.

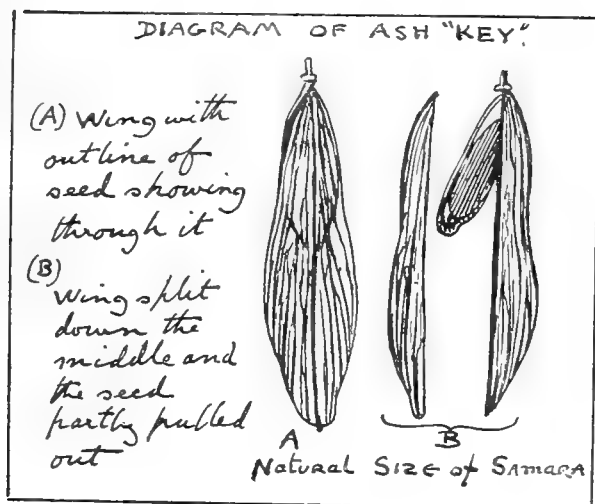
The flower of the Ash is usually bisexual ; the pistil is a female organ, the stamens are male organs. Occasionally the tree produces flowers that are unisexual. Sometimes both types are found on the same tree ; sometimes one tree bears male flowers only, another female flowers only.

The flowers of *Fraxinus Ornus* (the Manna Ash) which is not a native of Britain, differ from those of the *Fraxinus Excelsior* in having both sepals and petals.

THE SEED.

When the fruit of the Ash is split open it is found to contain a small flat brown seed. The minute white embryo plant lies within

this seed, surrounded by the store of food from which it draws its nourishment on first germinating, before its leaves have turned green, or its roots are able to obtain sustenance from the soil. Ash seeds do not usually germinate until the second year after they are formed. The leaves of the seedling (cotyledons) bear but



little resemblance to the leaves of the full-grown tree, for they are long and narrow and tapering at both ends. The succeeding pair of leaves begin to give evidence of their kinship to the Ash in their

serrated edges, although they consist of a single leaf instead of a series of leaflets. Sometimes the first pair bear three leaflets each. The distinctness of the seedling leaves from the mature type in all species of trees is very striking ; the subject will be dealt with more fully in later numbers.

THE TREE AND ITS USES.

The Ash (*Fraxinus Excelsior*) appears to be indigenous to Britain, though some doubt its right to be considered a native of Scotland. It grows best on a strong soil of some depth which is moist but free from stagnant water. Its tap-root goes deep into the ground, although its rootlets spread widely near the surface. The tree needs considerable space to show to perfection the characteristic development of its branches. When it is crowded by other trees the trunk continues undivided for some height above the ground, and the upper limbs are tufted with a head of spreading branches, an arrangement that is both abnormal and displeasing to the eye. A good soil is essential to the production of sound timber, as it ensures rapid growth, while a slow growth tends to produce "brittle" timber. Two hundred years appears to be the limit of age for an Ash, though it is probably at its best for useful timber at ninety years on good land, and at sixty if grown on marshy soil.

The timber is adapted to all purposes requiring a tough, elastic wood, such as axle-trees, shafts and tool handles of every kind, hoops and crates. For many of these purposes the tree is pollarded, as the coppice shoots grow rapidly. The value of all trees for coppice depends upon their capacity for bringing to life the dormant buds on the stool, or on roots near the surface of the ground after the stem has been removed. Some trees, such as the Aspen, send up most suckers from the roots ; others, as the Oak, from the stool.



ASH AND WYCH ELM.

("BANKS OF THE WHARF," EX ROYAL SOC: BRITISH ARTISTS, 1901.)

By permission of Dr. Joseph Needham, the owner of the picture.



THE SWEET-SCENTED WOODLANDS.

(EX: ROYAL ACADEMY, 1896.)

by J. M. W. Turner of R. H. Wilson, Esq., the owner of the picture.



Sp. Massena, 1741. 1741. Eng. 1741. 1741. 1741. 1741.

THE BEECH.

GENERAL REMARKS.



WHEN a tree stands by itself, the beauty and distinctiveness of the pattern it forms against the sky can be appreciated; a delicate tracery of branches, as in the Ash or Birch, or a compact and well-defined outline, as in the case of the Oak, Elm, Sycamore, and most evergreen trees.

But the Beech has neither of these characteristics, and to appreciate Beech trees one must be under and among them. We all love Beech woods. In winter the massive grey trunks, lichen-covered and moss-grown, rise in fluted columns from the spreading roots into a network of interlacing boughs and wiry twigs overhead. Brown and shrivelled leaves cover the lower branches which droop to the ground, and red-brown leaves underfoot rustle as a rabbit or pheasant runs in

amongst them. After rain these turn to purple, and the pale grey trunks are darkened by the water which has run down them and left stains to mark its course, while every twig reflects the sky.

In spring the flat, spreading branches are covered with young leaves, yellow-green and fringed with down. Through these the sun shines, making ever-changing patterns on the smooth trunks, and casting a chequered shade on the ground. Here the "feather-poke" hides her nest among the bluebells, and there are pigeons, chaffinches and woodpeckers in the boughs above.

Soon the leaves change to a glossy green, the brown and pink stipules are thrown off and lie thickly scattered amongst the limp green blades of the dying bluebells. The croziers of the new bracken are already well up.

As summer comes on the leaves look firmer and feel more crisp, while the yellow flowers hang like little tassels from the twigs. The tiny nuts form slowly, and ripen and crack when the wood is red and orange with the tints of autumn and the falling leaves cover the swaying seed-heads of the hyacinths.

RAMIFICATION.

The new shoots are given off alternately to right and left of the parent twig, and form just below the apex. The twigs are thus continuous but do not lie in a straight line, as is the case where the terminal shoot springs directly from the apex of the old twig.

The angles of twig and shoot alternate from side to side with perfect regularity, and this manner of growth results in the flat and spreading layers of twigs so characteristic of the tree.

The new twigs often form nearly a right angle with the branch, but the larger branches divide at an angle of about 45 degrees.

Where the largest limbs join the trunk the angle becomes filled up, and they appear to spring from it at a full curve.

Below its point of junction with the trunk, the outlines of each limb can still be traced; it keeps its own roundness and individual shape, sometimes as far down as the roots, and while forming part of the main stem, is only gradually merged into it. For this reason, in the oldest trees the trunk seems to be built up of many tree-stems put together (this is indeed sometimes the case), while the trunks of mature trees have a fluted appearance.

When many trees have been growing closely together, their stems are rounded instead of fluted, and continue upwards to a great height before dividing. If a tree has ample space about it, it divides into large limbs, as has been said, a short distance above the ground.

The topmost branches with their spreading twigs, form detached spires against the sky, which make the tree easily recognisable at a distance. The smaller branches are slender; the lowest ones at first spring from the boughs in an upward direction, then take a delicate curve and become pendent, supporting the horizontal layers of twigs and foliage.

THE LEAF AND BUDS.

In winter the buds lie flat in the same plane as the twig; the terminal bud is in a line with it, the lateral ones are arranged alternately along it.

The buds stand out from the twig, with their tips curving back towards it. They are about three-quarters of an inch long, light-brown, conical in shape and tapering to a fine point. The leaf-buds are more slender than the flower-buds, and in each the leaf lies straight from tip to base.

In spring the bud turns upward, and as it increases in length, light patches appear at the base of the brown stipules which have protected it during the winter. The tips of the leaves, fringed with white satin-like hairs, push their way out at the apex of the swollen bud, their edges still being folded like a half-closed fan. The bud now turns downwards, and the overlapping leaves straighten themselves. Between them the pale stipules hang like twisted ribbons; they gradually turn pink and drop off as soon as the leaves have developed. At the base of the bud stiff stipules still remain to protect the tips of the newer leaves. The scars of these stipules can be seen forming rings round the old branches. As the new shoot lengthens the leaves spread outwards, and become drooping; at this stage they are of a pale yellow green, almost transparent and very soft. The ribs and edges are covered with satin-like hairs, the under side is paler and less glossy. When fully grown the leaves are firmer, nearly flat and very crisp, with waved edges. In summer their colour is a dark green, which changes in the autumn to red and orange. They are arranged alternately and lie flat in the same plane as the twig, each one accommodating itself to the space available between its neighbour leaves.

Each twig usually bears from three to four leaves, the leaf at the base of the twig being smaller than the rest. The main and secondary ribs are clearly marked, their arrangement resembling that of the branches, but the network of small veins which covers the leaf is scarcely noticeable.

One margin of the leaf-blade is usually longer than the other, and joins the stalk at a point lower down.

The withered leaves of young beeches remain on the tree during the winter, and some few also linger on the full-grown trees. The



THREE BEECH TWIGS IN SPRING.

Notice how the buds are now curving upwards and compare them with the young ones formed during the summer, which are shown in the drawing of the fully-grown leaf. Also notice the stipules at the base of the leaves, and note that they had fallen before the leaf was fully developed.

buds expand about the middle of April, and the leaves a week later. The lower branches are often green while the upper ones are still in bud. The glossy texture of the young leaf accounts for the white lights seen in the spring-foliage when the sun shines upon it, and its transparency for the brilliance of the green.



LEAF FULLY GROWN.



FLOWER. BEECH MAST—CLOSED, AND OPEN SHOWING NUTS.

THE FLOWER.

In May, before the stipules have fallen, the male flowers appear, little oval tufts of down, silver and pale-yellow, at first resting on the leaves, and later on hanging under them from long stalks. The male and female flowers grow separately on the same tree; the male flower-stalks in clusters of from three to four, each slender stalk bearing from five to ten florets, the female stalks solitary, stouter and upright. The female flowers are arranged in pairs, each pair being surrounded by the "cupule," the little cup or "shell" formed of coherent tracts. In each flower the ovary ripens into a shiny triangular brown nut, so that every "shell" contains two of these nuts. By the time the fruits are ripe, in October, the shell has become brown and woody and covered with blunt prickles, and opens into a four-pointed star, exposing the nuts within.

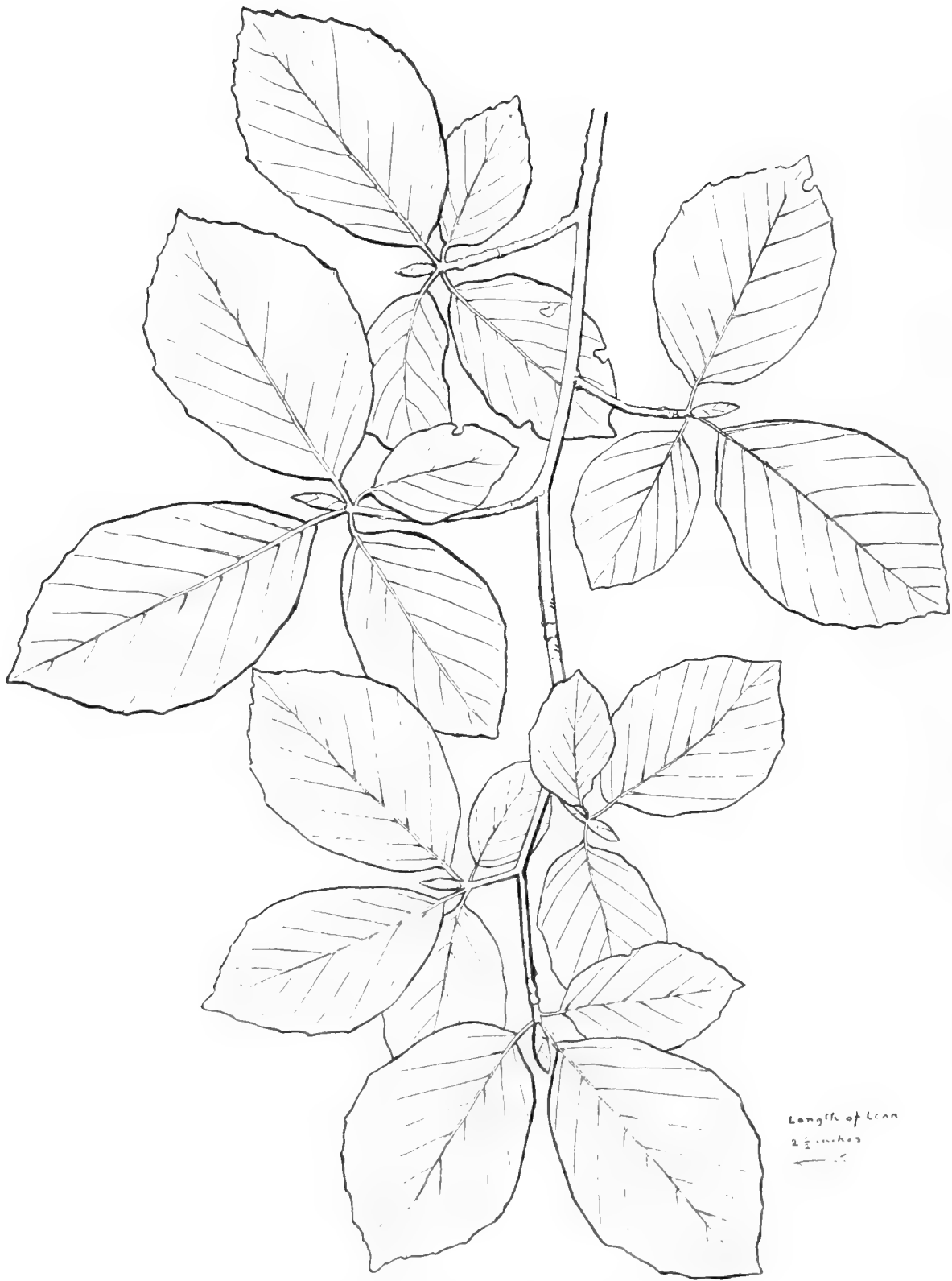
THE BARK.

The bark of the Beech-tree is thin and smooth. In colour it is purple-grey, but the lichen and moss which grow upon it make it more often appear grey-green. The fissures in the bark are horizontal and accentuate the roundness of the trunk.

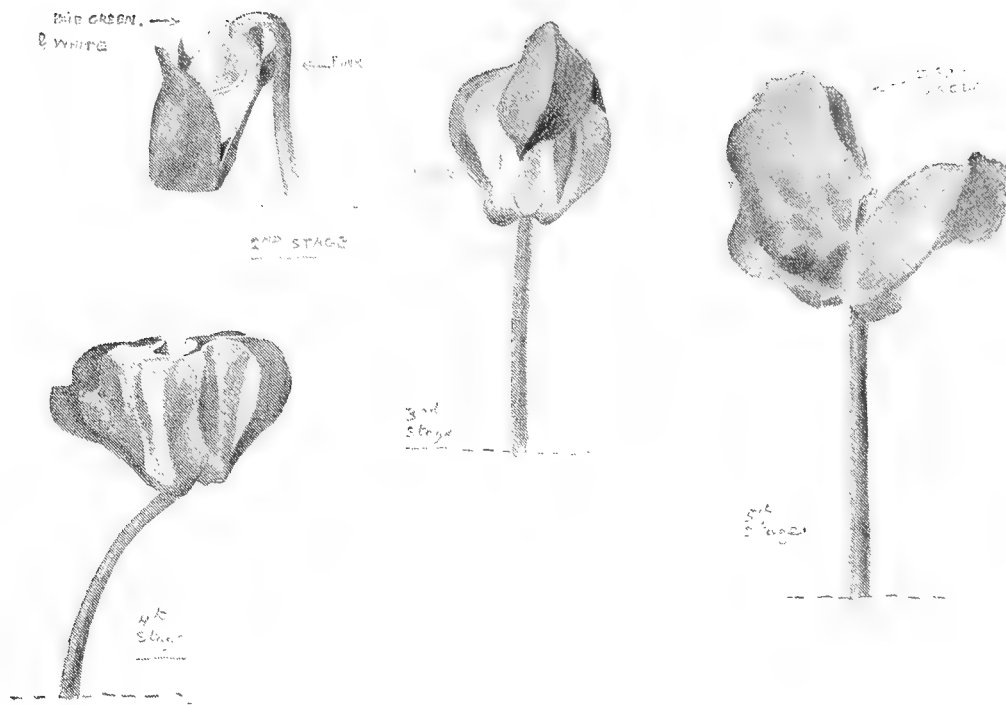
As with the Hornbeam and the Holly, knob-like excrescences are sometimes formed on the trunk; they may be compared to adventitious buds covered with bark, as branches occasionally grow from them. They are woody and solid, and can easily be detached from the trunk by a sharp blow.

THE BEECH (*Fagus sylvatica*).

The height of the Beech-tree varies from 80 to 100 feet, and it lives from 80 to 150 years. It prefers a chalk soil with natural leaf-mould, and suffers from extremes of moisture, or of dryness, or from prolonged cold. The seedling has fan-shaped cotyledons very unlike the fully developed leaf.



PLAN OF LEAF ARRANGEMENT.



BEECH SEEDLING.

"2nd stage."—The seed-leaves being pulled out of the split husk.

"3rd stage."—Seed-leaves standing upright with husk still adhering.

"4th stage."—Freed from the husk they expand.

"5th stage."—The young shoot starts up between them.

"6th stage."—The young shoot bears a pair of real leaves.

The dotted lines represent the earth



Seedling—6th stage.
(The size of nature).



BLACKTHORN (SLOE).

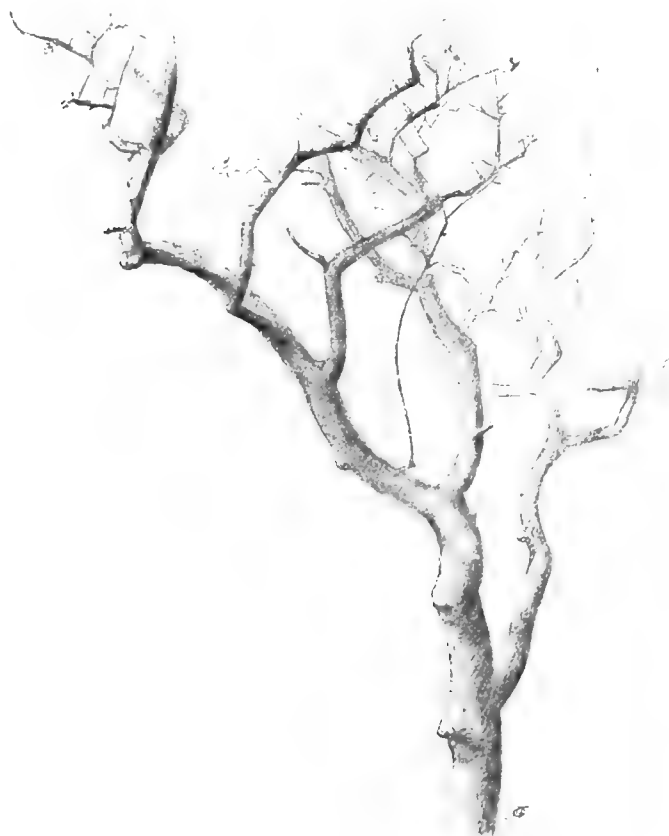
GENERAL REMARKS.



HE winds of March drive over the bleak uplands. On the hillsides a cold sunlight plays, between the showers, upon the larches. Their twigs still look like a veil of golden mist, though here and there already a tinge of brilliant green suggests the livery of spring. The purple twigs of the birches and alders are tasselled with yellow catkins, and the hazel

with its "lambs' tails," while the elms bear a load of red blossom, and in the woods is a carpet of white anemones powdered with primroses.

But out in the open, the only flowers to be seen are those which



cover the leafless branches of the Blackthorn like a sprinkling of snow-flakes. This, each year, is its moment of grace. Gnarled and twisted, dwarfed and unlovely, the tree crouches at the edge of the moor, where a wall affords it a mere pretence of shelter. Its very shade

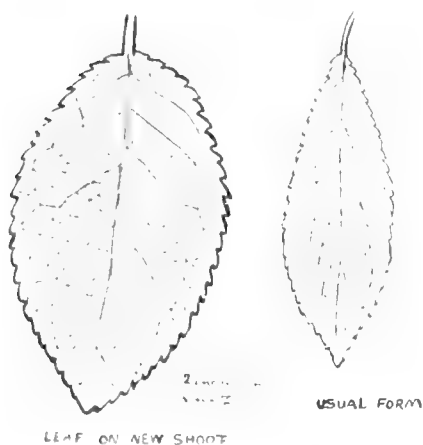
is inhospitable, and fragments of wool torn from the backs of passing ewes are found clinging to its thorns. In the moist soil of the woods existence is less of a struggle: the tree thrives, and its suckers spread rapidly in all directions and possess themselves of the adjoining land. Grey lichens creep over the branches, and masses of knotted twigs envelop them, and tempt the long-tailed tit to conceal its nest in their midst. Autumn brings ripeness, though no sweetness, to the clusters of fruit, and they mingle their rich purple colouring with the gay tints of the undergrowth in the fall of the year.

RAMIFICATION.

Each year several new shoots, long and straight, are produced, and the leaves upon these shoots are arranged in a spiral order, from five different points. Thus, on a foreshortened shoot only five leaves radiating from the stem would be visible, since the sixth would be hidden by the first and the seventh by the second leaf. The branches which come after rarely keep to this symmetrical arrangement of the foliage. While the growth of some is arrested so that they become mere spikes, others are so stunted that the intervals between the twigs which they bear in their turn are not perceptible. Many appear to spring from one point, and crossing one another they spread in various directions, the short twigs and spikes standing away at right angles from the branches, the larger ones at less than a right angle. This method of ramification results in a matted bush or thicket of stout branches or twigs, supported on an upright stem with slender suckers grown round it, the whole rarely standing six feet in height. Occasionally, where there is no room for the outward spread of its branches, the tree reaches a height of 12 or 15 feet.

THE LEAF.

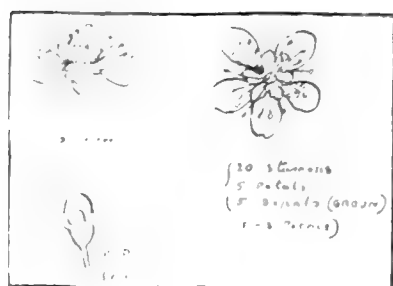
The leaf varies from $\frac{3}{4}$ to $1\frac{1}{2}$ inches in length and, at its widest point, from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in breadth. It tapers towards the base and



has a finely serrated edge. The normal form is shown in the diagram. Its colour, at first a delicate pale green, becomes dull and heavy as the season advances. The under-side of the leaf has a dull matt surface. The mid-rib is prominent. The leaf-stalk is of a pale green or reddish-green tint on the upper side, and red on the lower side.

The leaves are usually found in a horizontal position, with the tips turned down; on the new shoots and suckers the leaves are rounder in shape and lie flat, with the angle between the leaf-stalk and the twig somewhat acute, so that they point in an upward direction.

Reference has already been made to the spiral arrangement of the leaves on shoots of normal development: where the growth of the shoot has been arrested, the leaves often appear in clusters, five leaves radiating in a circle from a group of six buds. The single leaves have usually three buds in the axil of each.

THE FLOWERS.

The flowers appear in March and April before the leaves. They consist of five petals, five sepals, a single carpel forming the ovary and yellow-tipped stamens.

The petals are pure white and open very wide, so that spaces are left between



BLACKTHORN



A VARIETY OF BLACKTHORN.

them. This gives the flowers an effect of raggedness which distinguishes them from the many flowers of similar construction. The flowers are found growing singly or in clusters, but each one has invariably its own separate stalk, which connects it with twig or spine. It is worthy of note that the spine being merely shoots of arrested growth can bear flowers and leaves, while they cannot, like the prickles upon a rose tree, easily be detached from the stem.

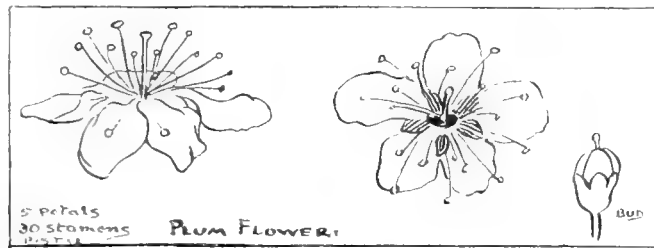
THE FRUIT.

The Sloes take the place of the flowers and often form dense clusters at the axils of the twigs. At first of a dull green colour, by the end of August they wear a bluish-purple bloom, and where this bloom is rubbed away by the movement of the branches the berries show a purple-black or green-red surface according as they are or are not exposed to the sun.

It should be noticed that the rudiment of the "sloe" or fruit, is inside the green cup at the base of the flowers. From the edges of this cup the sepals, petals, and stamens spring. These with the cup fall away, leaving only the pistil, the ovary of which forms the fruit. The cherry has flowers and fruit of the same essential structure though they differ considerably in their outward appearance.

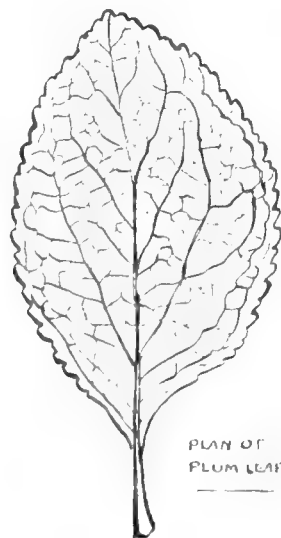


NOTE.—Though the Sloe and Plum flowers here represented happened to have twenty and thirty stamens respectively, this is not always the case. Their number, however, will always be some multiple of five.



THE BLACKTHORN (*Prunus spinosa*).

There are many varieties of the Sloe, such as the Bullace tree and the Wild Plum. The chief distinction between these and the Sloe lies in the simultaneous appearance of their leaves and flowers. The leaves also differ in being downy, the twigs are devoid of spikes, and the flower and fruit larger.



PLAN OF
PLUM LEAF



BEECH AND HOLLY.

"SPRING'S DELIGHTS ARE ALL REVIVING." (EX: ROYAL ACADEMY 1900.)
*By permission of Messrs. Raphael Tuck & Sons, Ltd., Publishers of the large photographic
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THE HOLLY WHEN FOURTEEN
INCHES IN HEIGHT.

THE HOLLY TREE.

GENERAL REMARKS.



AN old Holly might well be supposed to play the wizard's part in the enchantment of the woodlands. Its trunk crouches above the ground, and from it rise the stems in grotesque curves and twists, now closely intertwined, now reaching out hither and thither, half concealed by a dark canopy of overhanging foliage. Festoons of honeysuckle are wreathed about them: over the trunk lichens creep, while velvet green mosses and tiny ferns fill in the hollows. The ground beneath is hoary with the fallen leaves of many bygone seasons. As you look past the veteran at your side there are more trees, one beyond the other in long vistas: they are magicians all, and in league with the sky.

The polished surfaces of their leaves are its mirror: they glitter silver white in the sunlight, they reflect the blue of summer and the grey moods of duller days. They grow dark and heavy under the influence of a passing cloud, when all the surrounding foliage seems fresher by contrast and of a more delicate green. If the topmost boughs become sparse and scanty under the stress of weather, there is the more opportunity for bright intervening patches of sky.

In winter the sombre foliage of the Holly plays a kindly part in filling the empty spaces between the trunks and the lower branches of the leafless trees; and when the ground is covered with snow, and stem and leaf are powdered with white, nothing can dim the bravery of its scarlet berries. The "Hollen" can be trained to form a dense protecting hedge, or trimmed, like the box, into the neat conical bushes that are so characteristic a feature of the formal garden, or again it will make a sheltering porch for the garden gate of the cottage. With rich and poor, the Holly tree of song and story finds favour everywhere.





HOLLIES WEIRD AND FLOWERS OF SPRING.

(PA. ROYAL ACADEMY, 1901.)

THE BRANCHES AND HOW THEY RAMIFY.

On a young shoot of Holly the leaves are arranged singly in spiral order with great regularity.

A corresponding regularity in the twigs which should replace the leaves at a later stage of growth is, however, not to be looked for. A few words of explanation may be needed upon this point. Many species of trees of dissimilar growth resemble one another in the arrangement of buds upon the twigs: the sycamore and the ash are typical of one set of examples, the poplar and the apple of another. How then account for subsequent divergences? There are many matters to be taken into consideration.

In some cases the lateral buds fail, or the branches they produce are not fully developed. In others a flower is produced at the apex of the terminal shoot and the growth of the trees must therefore be continued by the lateral buds. Again, a comparison between different species of trees makes it evident that the distances between the nodes (*i.e.*, the points whence spring the leaves and subsequently the branches) has a considerable influence upon the general aspect of the tree. In the Holly, which is slow of growth, the internodes are apt to be so short that the branches appear to spring several from the same node, giving a bushy effect to the tree in strong contrast to the growth of the poplar, where the nodes are widely separated and the twigs sparse. Where flower buds are found at the angle of junction of the leaf and twig, and not at the apex of the twig, there will be no lateral branches at the point of inflorescence. But in all these cases, the failure to produce branches exactly corresponding to the position of the leaves is due to a method of growth which is a constant feature in all the trees of a species, however obscured by accidental causes in individual members.

To turn now to the Holly, the new shoots are straight and stout, but they grow from the branches in a slightly curved direction, and form with them an angle rather less than a right angle. The node from which they spring becomes thickened, but not so much so as to conceal the sharpness of the angle of divergence (which comes about in the case of the elderberry). These young shoots are of a rich green colour, rounded, smooth and glossy. When the tree stands by itself the main stem is clearly marked from the ground to the summit; the lateral boughs are longest near the base of the trunk, and decrease in length, with great regularity, towards the apex. To this the tree owes its markedly conical outline, which is only broken by an occasional shoot that has straggled beyond its due limits.

In old Hollies which have grown up amongst other trees, the trunk usually divides a few feet above the ground, and from this base large limbs spread away with a full curve, not unlike those of the beech. Continuing their upward growth, and decreasing in girth by successive stages as they give off branches, these limbs may be traced up to the very top of the tree. Adventitious shoots spring up from them, and their long vertical lines are conspicuous from the curved and often horizontal lines of the limbs they grow from. Vertical branches are also found growing from the stem of a fallen Holly where the roots have not been severed. The lower branches droop nearly to the ground, and then rise again, making double curves of much grace. The main stems are often twisted on their axis, and show much variety and richness of colouring, for on the underside, where little affected by the weather, they are reddish grey, while on the upper and exposed side, greyish lichens cover them, which are transformed by heavy rains to a mossy green. The bark is naturally smooth in texture, but in old trees its surface is broken by scars



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OLD HOLLY STEMS.

Notice that the bough bearing the leafy adventitious shoots is supported by a stem that has become united to it.



SOME FANTASTIC STEMS.

and knots which mark the loss of boughs torn away by the weight of the snow or perished through lack of light. The trunks are also curiously marked with spots or excrescences of a whitish hue, which are arranged about them in circles, and serve to accentuate their roundness. Occasionally woody knobs projects from them, similar to those described upon the beech.



May 27

28

OPENING LEAF BUD.

THE LEAF.

In April, the Holly begins to show signs of life; the ground beneath becomes strewn with fallen leaves and the buds are bursting. Early in May the new leaves appear; they are soft to the touch and of a brilliant green. One by one they expand and spread away, while the edges of the leaf blade, which have hitherto been folded together, separate. At the apex of the shoot the youngest leaf is still directed upwards, but its tip is bent back, so that the central rib and the leaf stalk taken together form a double curve between the extreme point of the leaf and that of junction with the shoot. The new stem in course of formation is a dull green in colour or sometimes dark red. As the leaves mature they stiffen and take on a darker tinge. The spines which appear at the points where the curves of the leaf-

edges intersect, grow hard and sharp. The position of the leaf becomes more horizontal; as it grows older it even droops. Holly leaves are remarkable for their thick leathery texture, and the bright gloss on their smooth and undulating surfaces: the underside is, however, dull, and paler and yellower in tint. The accompanying drawings will give an idea of the shape and formation of the leaves. When fully developed they are about two-and-a-half inches long and one-and-a-half inches wide, and attached to a stout short petiole which springs from the shoot in a similar line to that which the shoot takes from the bough: at the base of the young leaves are tiny stipules. As a rule the leaves on any one tree are either all furnished with spines or all smooth at the edge. Occasionally some smooth leaves are found on the upper branches of an otherwise prickly-leaved tree. Holly leaves have the power of reflecting a more brilliant and iridescent high-light than those of any other tree. This brightness of the reflected light is due to the polished surface of the smooth thick leaf, while the many-coloured reflections on the leaves of any one tree (or even, it may be, on a single leaf), are occasioned by their peculiar forms. These are so much curved and twisted that the leaf-faces are not all in one plane but lie at very various angles, each of which may reflect a different portion of the sky or borrow the bright hues of different surrounding objects. This is most noticeable in the case of leaves on the edge of the tree, which are seen foreshortened, and thus reflecting the sky immediately in front of the observer. Thick as the leaves are, when still young they are not so opaque, but that the sunlight can shine through them and heighten the vividness of their fresh green. The young foliage is sometimes tinged with red, and the shell-like leaves on certain of the variegated species are beautifully shaded with white and pink when they first expand.

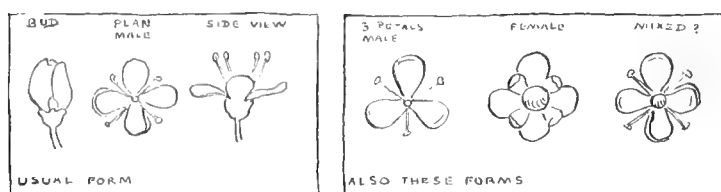


BRANCH OF SMOOTH-LEAVED HOLLY IN FLOWER.



THE BERRIES AND FOLIAGE.

THE FLOWER AND SEED.



With the new leaves come the flower buds. These cluster round the stems at the axils of the leaf petioles. When the outer covering of the bud expands, the four petals, folded together at the tips, appear like a tiny yellowish-white ball. These soon open out, and show the four stamens and the four pistils which they enclose, and which make up the perfect flower. It is creamy-white in colour, and of a pleasant scent. The flowers, however, vary both in sex and formation: they are of three kinds, male, female, and mixed. These different types are found both on separate trees and in separate blossoms on the same tree. In the female flower the ovary is conspicuous for its size in comparison with the petals. Flowers are often found in which the number of petals and of stamens exceed that of the typical form. Diagrams of some of the more ordinary forms are here given.



The unripe berries are green; during the summer they change to red, and become a brilliant scarlet by the end of the year.

In shape they are usually elliptical, sometimes round, and about a quarter-of-an-inch in diameter.

THE HOLLY (*Ilex Aquifolium*) is a hardy evergreen of slow growth. It will attain to a height of 50 feet, and lives to a great age. The various species are natives of Europe and Western Asia, and the tree is indigenous throughout Great Britain.

THE SPINDLE TREE.

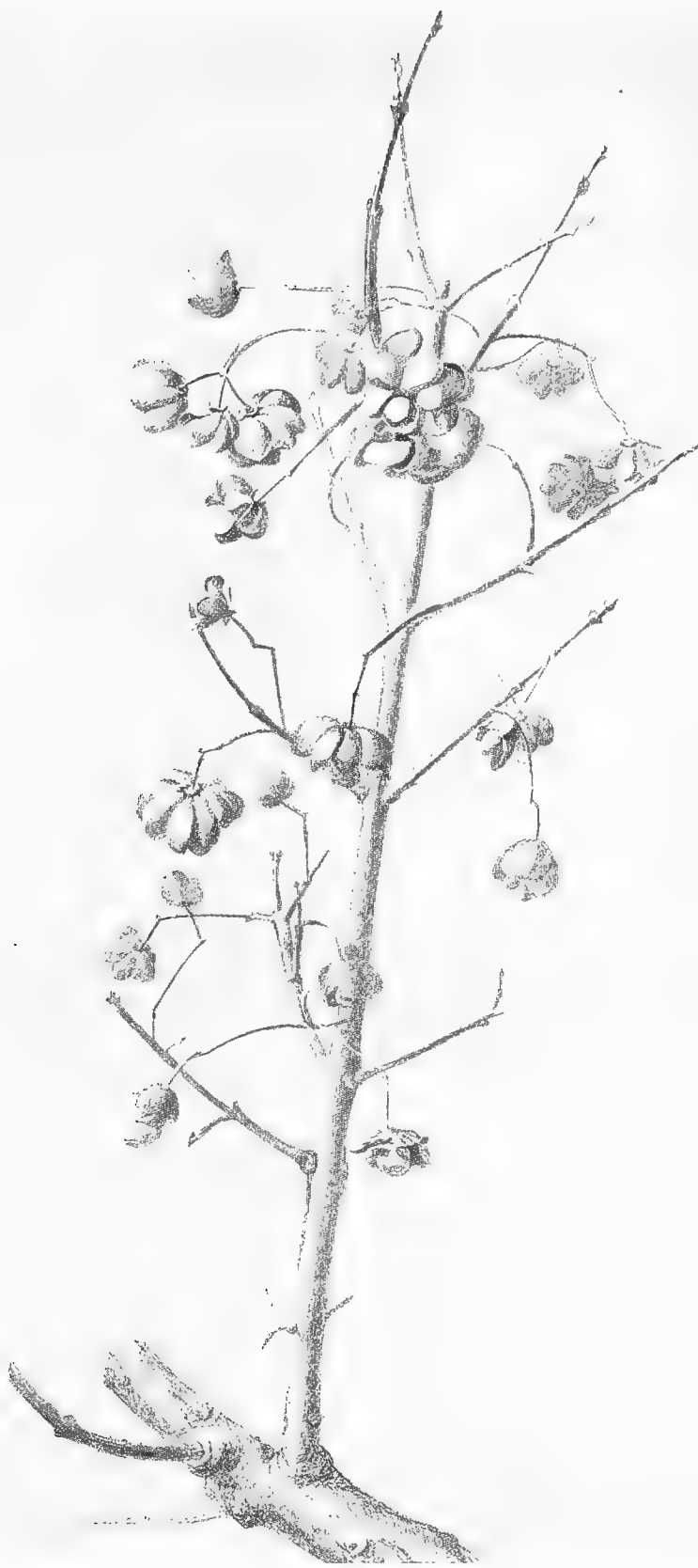
GENERAL REMARKS.



THE husk and seed of the Spindle Tree, so beautiful and decorative in form, so brilliant in colouring, are its chief glory, and the marvel of their development from a small and insignificant blossom is none the less striking because so much an every-day feature of plant life. And indeed until the time of fruit bearing arrives, the Spindle Tree has nothing but the somewhat unusual hue of its smooth and rounded branches to mark it out for the passer-by from many another pretty hedgerow shrub.



SPINDLE FLOWER.

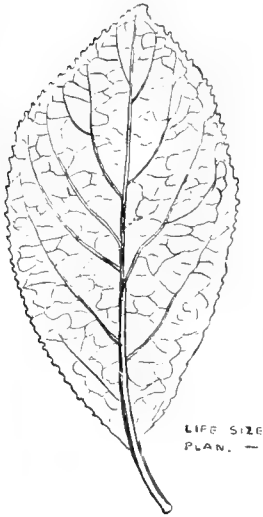


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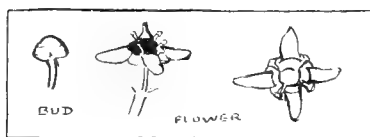
SPINDLE BRANCH BEARING SEED.

THE LEAF.

The new shoots are smooth and of a paler green than the mature wood. The branches are arranged in opposite pairs; each pair at right angles to the one above it. In springtime a pair of undeveloped leaves grow upright at the tip of each new shoot; these are needle-shaped and show the under side only, since the two edges are rolled towards a central rib which runs from tip to base. An older pair of leaves partly unfolded, forms a protection for this terminal pair. Below these grow other leaf-pairs, which have flattened out and stand away from the twig. The leaves which are at first of a brilliant transparent green, later on become darker and their oval form more rounded. The surface of the leaf-blade is smooth, but not glossy, and has an under-side which is paler than the upper, and a toothed edge. It somewhat resembles the leaf of the privet, but is larger, more pointed and less opaque. In autumn it turns deep crimson.

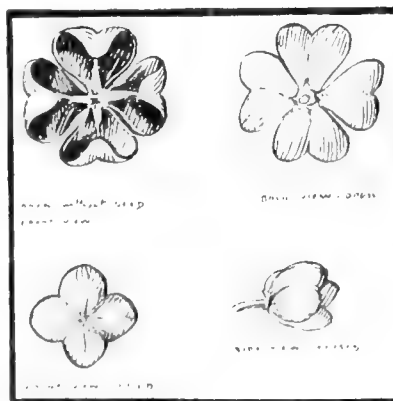
THE FLOWER AND SEED.

Near the base of the new shoot the place of the last pair of leaves is supplied by a pair of modified leaf-like appendages, often to be distinguished by the patch of scarlet at their tips. From the axils of these, and of the leaf-pair immediately above them (and not from the apex of the shoot) grows the main flower-stalk in an upward direction. This main stalk gives off other and smaller flower-



stalks from its apex; these are usually placed three in a row, but are sometimes more numerous, and they support the florets. The central floret is the first to develop from a round bud of a very pale green and not more than one-eighth-of-an-inch in diameter. The flower stalks are green like the shoots, curved, and about an inch in length. At the junction of the secondary with the main stalk are tiny colourless stipules. The small star-shaped flowers open in May: they are composed of four pale-green pointed petals, set like a cross and expanding stiffly.

The edges of each petal are bent back so that they all but meet on the under side, and between them the green sepals are plainly visible. Four short pink-tipped stamens surround the conspicuous dark-green ovary. The seed-covering, which in September succeeds the flower, is very beautiful: capsules of rose-colour enclose a seed membrane of brilliant orange hue. The form and size of this husk is fully explained by the drawings.



SPINDLE TREE *EUONYMUS EUROPEUS*.

The Spindle is a native of Europe and Western Siberia.



SYCAMORE TREES.
From a Water-colour Sketch.

THE SYCAMORE.

GENERAL REMARKS.



DAY by day, throughout the spring and summer, one may find fresh delight in watching the swelling buds, the unfolding leaf, the young flower, all the miracle of growth in the Sycamore. Early in the spring, when oak, beech and ash are still only in bud, its bright green foliage lends colour to the woods, and in the undergrowth, the opening leaves of its saplings shine red-tinted in the sunlight. Its regular branches and erect stem endow the tree with stateliness of character, and its broad leaves cast a heavy and grateful shade.

RAMIFICATION.

The young Sycamore is conspicuous for the simple and well-defined arrangement of its branches, which spring in opposite pairs at regular distances along the smooth trunk, while the new shoots near the end of the stem are very short and grow out almost at right angles to it. In old trees the lower boughs sometimes spread horizontally, but the prevailing angle of the branches is about 60 degrees.

The buds form on the shoot at some distance apart, and every bud is usually developed; hence regularity of growth is maintained for some years in the young tree. But in old trees the outer branches become bent, while the twigs are stunted, dark in colour,

knotted and ringed with scars ; again, a pair of twigs curved round into semi-circular form terminate the branches.

The cause of this departure from the vigorous and regular character of the young tree is twofold. Firstly, the growth of the twig ends wherever a flower is developed, and, in the second place, the arrangement of the leaves is not as with the lime or beech, alternate and in the same plane with the bough, but on long petioles and in opposite pairs, set at right angles. This necessitates the growth of the twigs in an upright direction, or for those developed from buds on the under side, in a horizontal upward curve.

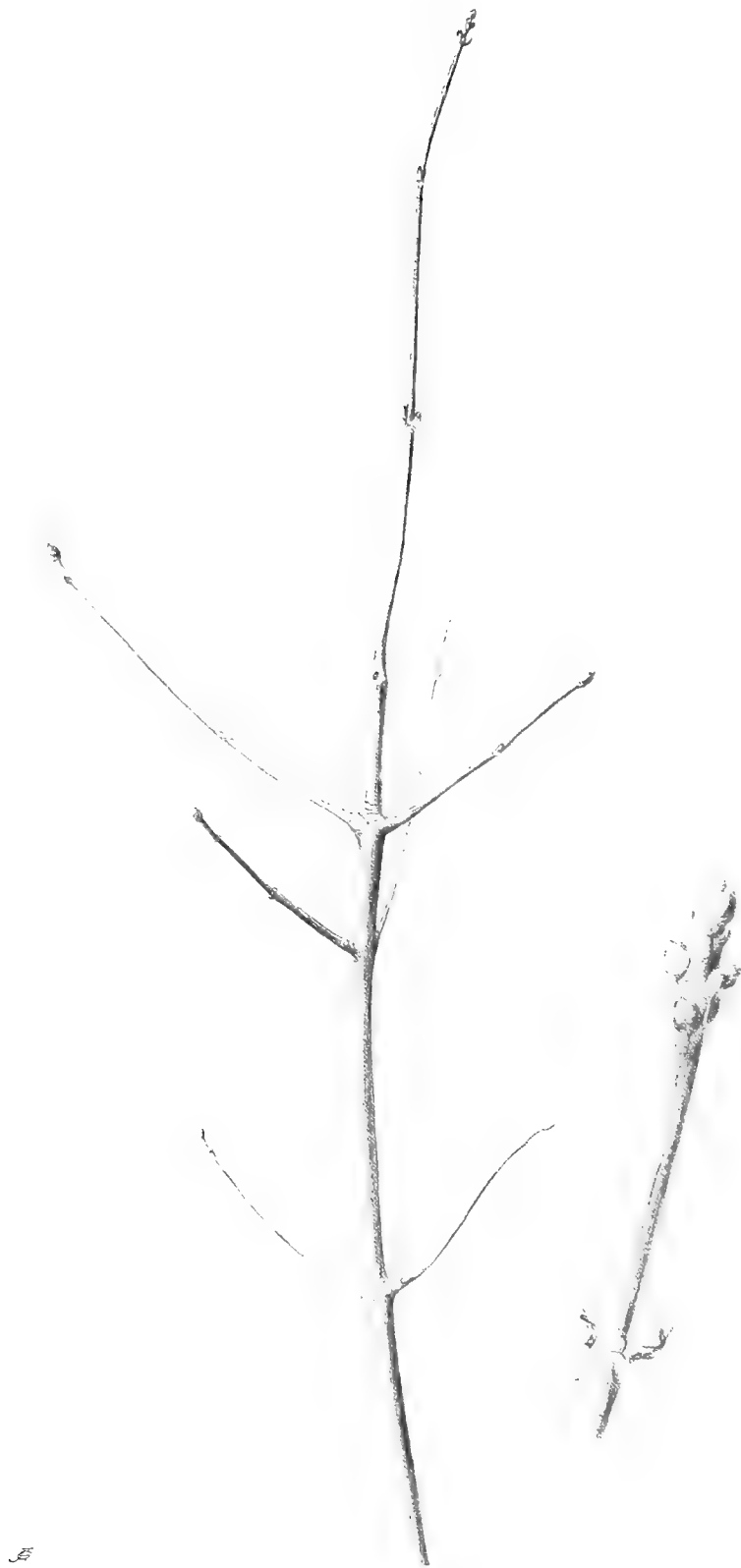
The main trunk of the tree is well marked from root to crown ; for although it often divides into two at no great height from the ground, the twin stems continue upward side by side, and give off boughs that are slight in proportion to those of an oak or alder, where it is frequently difficult to distinguish the larger limbs from the trunk.

The terminal twigs, in full grown Sycamores, are short, and the flat leaves lie close together and form dense masses of horizontal foliage ; but on the other hand the boughs are few in number for the size of the tree, so that, even under the summer leafage, the trunk is not entirely concealed.

In young trees the stem is smooth and round, but with age it becomes buttressed.

The roots are spreading, and, like the beech, the trunk appears to be growing out of the ground, rather than, like many of the pines, to have been planted into it.

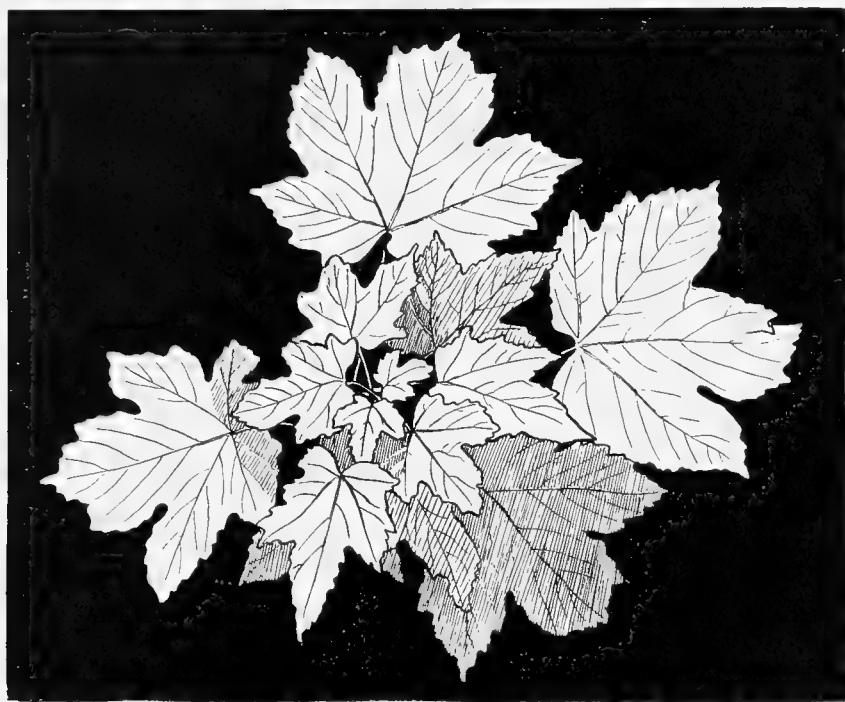
The boughs of the Sycamore decrease in length towards the apex of the tree with such regularity, the twigs are so blunted, the masses of foliage so compact, that there are few curves in the



BRANCH ARRANGEMENT ON A YOUNG SYCAMORE.



outline it forms against the sky. This is, as it were, built up of straight lines: a straight line across the trunk from point to point of the lower boughs; two straight lines converging from these extremities towards the summit of the tree; another straight line giving it a flat-topped appearance, and completing an irregular four-sided figure. This should be compared to the semi-circular form of an oak, a conical fir or larch, or the broken outline of a beech.



LEAF PATTERN AS SEEN FROM ABOVE.

As the leaves are large and flat, and arranged horizontally in groups, the shadow cast by the upper upon the under foliage is very noticeable, and the Sycamore forms, in this respect, a complete contrast to such a tree as the black poplar, where the leaves hang vertically and grow singly at some distance apart.

THE LEAF AND FLOWER AND THEIR
DEVELOPMENT FROM THE BUD.

The shoots of the previous year, which bear the buds, are smooth, grey-green in colour, and rounded. The part, however, on which the buds form is hexagonal. On young Sycamores the buds are larger than those on old trees.

In winter they are nearly oval in outline, the terminal one of the same width as the shoot, the axillary ones smaller, and standing out from the twig. They are covered with pairs of opposite scales, which overlap one another like roof tiles. Each scale is sharply bent down the centre, till the two halves are almost at right angles to each other, and disguise the oval outline of the bud, making it appear four-sided. At this stage it is about half-an-inch long and of a bright glossy green. As spring advances, the inner scales push their way forwards, and expose a surface of downy white, which changes to bright pink as they lengthen and expand beyond control of the short green outer scales, now holding them only at the base. The bud is now club-shaped, and nearly two inches long.

Soon the leaf, upright within its envelope, and folded together at the main rib and again at the central rib of each lobe, begins to force the enwrapping scales apart, and its underside, in some trees white and downy, in others of a dull red-green, becomes visible at the apertures. Next the leaves push out at the apex, and the outer pair unfold and expose an upper surface of glossy red-green to the sky. As their stalks lengthen they spread away from the sheath, and finally droop downwards, umbrella fashion, leaving the pair which are next to emerge still bending towards each other, and the innermost pair lying close together.

Where it is a flower bud which is under observation, the blossoms, still tightly compressed into a spike of bright green colour

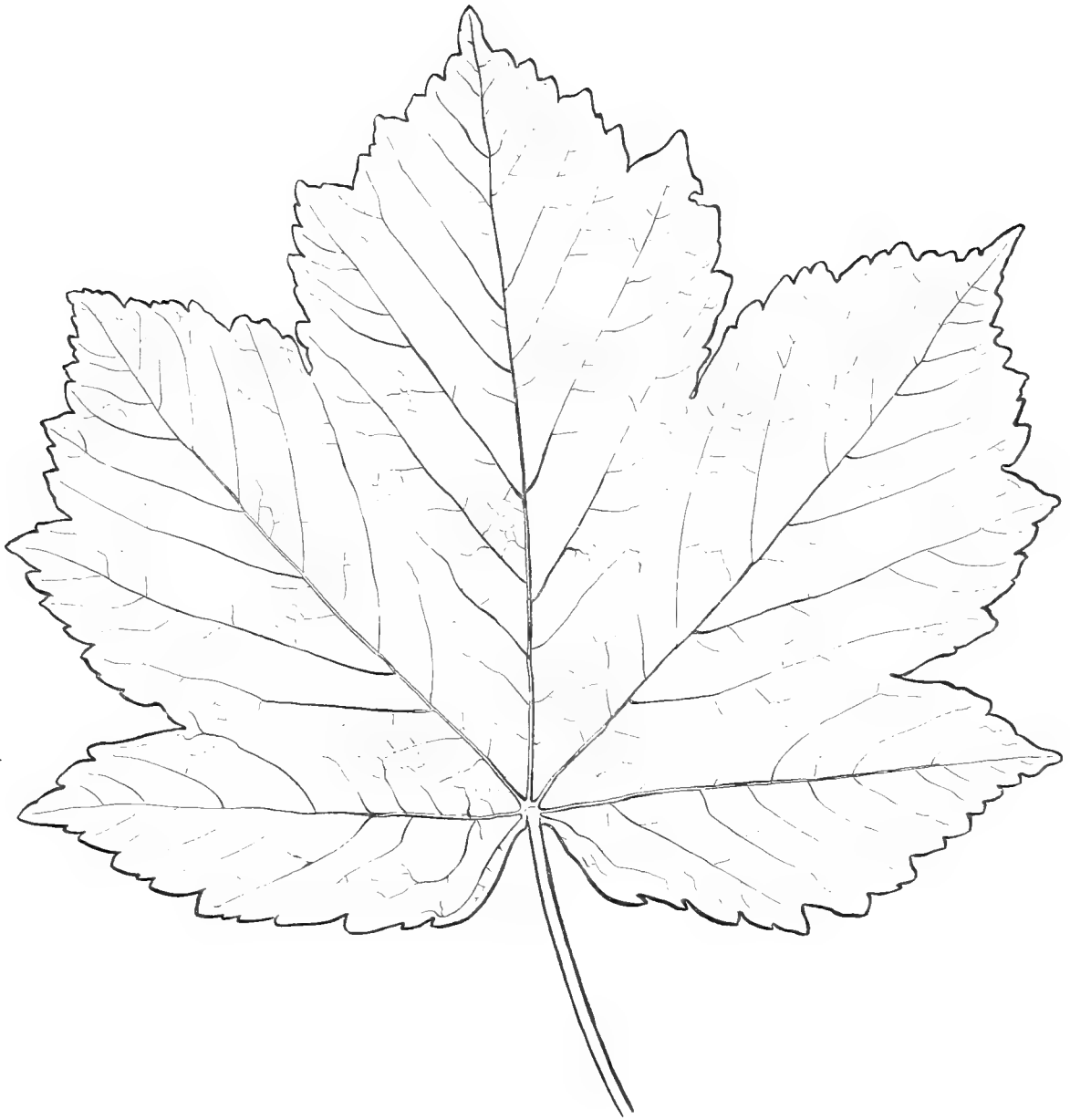


LEAF BUDS BURSTING.



DEVELOPMENT OF THE FLOWER BUD
AND YOUNG LEAVES IN TWO STAGES.

Notice the increased length of the Stipules and the drooping position of the leaves in the lower drawing.



PLAN OF LEAF.



THE OPENING FLOWER OF
A VARIETY OF SYCAMORE.

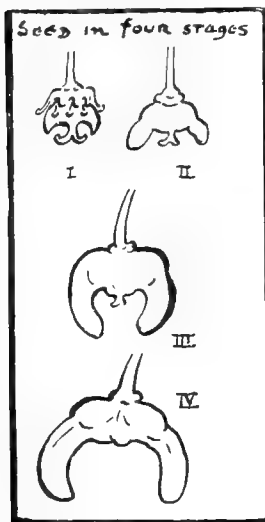
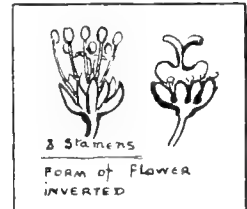


FULLY DEVELOPED FLOWERS.



GROUPS OF FRUITS.

are seen like a pinnacle rising erect from the circlet of drooping leaves. As the leaves enlarge and flatten out, and then stiffen and become horizontal once more, the flower gradually bends down and unfolds, until early in June it has developed into a raceme of green blossoms about four inches in length. Each flower bears five petals, five sepals, eight stamens and a pistil, and grows on a separate stalk; the main flower stalk bears opposite pairs, of these secondary ones, diverging from it at equal angles. The flower cluster is now pendent under the broad dark leaves.



As summer passes, two small green fruits, hard and round, take the place of the flower; they hang downwards, at first firmly linked together at the end of the flower stalk. Every two-lobed fruit is furnished with a pair of green membranous wings springing from the base in diverging directions. These wings are about one-and-a-half inches in length, and late in the summer change colour from green to rose-red.

The shape of the leaf, with the most conspicuous veins, is shown in the drawing. The veins show clearly, on the upper side as an indented groove, on the under side as a ridge. The small veins which cover the leaf are hardly noticeable, yet the blade is drawn into puckers between them. Both sides of the leaf are smooth, the upper side the most glossy, the under side the lighter in colour, and in summer it is covered with a gummy substance. Its length varies from five to eight inches, and its width is even greater.

The Sycamore is one of the first trees to shed its leaves; they usually turn yellow before falling, but often shrivel while still on the

tree, and become disfigured with black rings caused by fungi. The petiole is longer than the leaf, straight, rounded, and thickened at the base; underneath it is light green in colour, on the upper side, particularly near the leaf, of a dull red, and it is placed on the twig at an angle of about 60 degrees. The leaves all lie horizontally, but the lower ones are furnished with longer petioles, and are thus enabled to spread out beyond the upper, and so to obtain light and air. This arrangement is shewn in the diagram of the leaves seen on preceding page.

THE SEEDLING.

The seed leaves, or cotyledons, of the Sycamore are narrow pointed bands of light green, about two inches long and a quarter of an inch wide. Each pair, when first they come above the ground, is enclosed in a circular seed case; in this they lie face to face, rolled up, from tip to base; sometimes they are rolled after the fashion of a watch spring; more often the direction of the curve is interrupted at a point, and the spiral reversed, owing to the cotyledons bending back upon themselves. When they break out from this husk they unroll and separate, disclosing the first true leaves. These leaves are heart-shaped, with a long tapering point and serrated edges, and possess only the rudiments of the lobes characterising the future leaves.

THE SYCAMORE was introduced into England about the 15th century. It will grow in exposed positions, and the branches are not much affected by a prevailing sea-breeze.

Its growth is very rapid, and during the first ten years it will reach a height of 20 feet, finally attaining to some 90 feet, with a girth of 25 feet.

It reaches maturity in fifty years, and lives for one-hundred or one-hundred-and-twenty years.



HOW THE SYCAMORE GROWS FROM THE SEED.
IN FIVE STAGES.



SPRING IS COME.

(EX: ROYAL SOC: BRITISH ARTISTS, 1904)

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THE OAK.

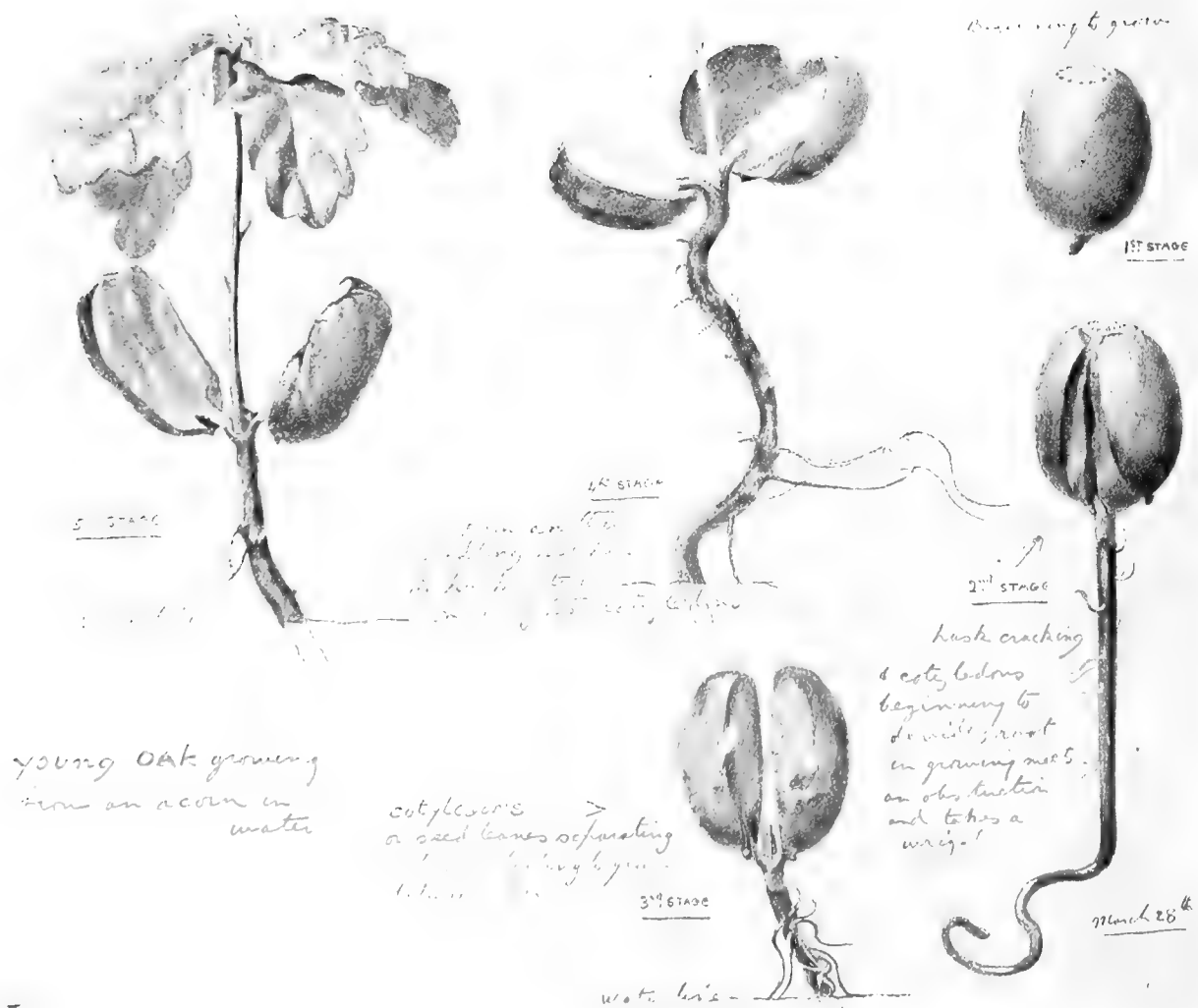
GENERAL REMARKS.



RANDEUR is the quality which specially distinguishes the Oak. Other trees may please the eye by their graceful lines, or the exquisite tracery of their foliage, or by the impression they give of slimness and fragility, but length of days and stubborn strength belong to the Oak, and in old age its huge angular boughs, its gnarled stem and weather-beaten bark, bear testimony to its toughness and durability.

More than any other tree it seems to show itself indifferent to all the powers of the elements. Its massive horizontal boughs as it were defy the force of gravity. You seldom see the boughs twisted by their encounters with the winds of heaven, or the compact masses of foliage injured by the storm. If the roots meet with obstruction the sympathetic trunk merely bends to regain its natural poise.

Its tenacity of life is marvellous. Where an Oak has been cut back, a new stem often of considerable size will spring up. When time has made a cavernous hollow of its bole, and its great limbs have been torn away, the upper boughs still put forth leaves. In the last stage of all, when nothing of its former grandeur is left to it but the greatness of its desolation, the Oak is still "monarch of the forest" in its fallen strength.



THE OAK. QUERCUS ROBUR (PEDUNCULATA AND SESSILIFLORA).

FIG. 1. BEGINNING TO GROW.
 FIG. 2. MIDDLE AGE.
 FIG. 3. OLD AGE.
 FIG. 4. THE LAST STAGE OF AGE.









GENERAL DESCRIPTION.

There are two species of Oak, both of which are common in England, namely, *Robur Pedunculata*, and *Robur Sessiliflora*. They may be distinguished by certain characteristics. The acorns of *Robur Pedunculata* are oblong in shape and are borne on long fruit stalks, while the leaves have short foot stalks. *Robur Sessiliflora*, as the derivation of its name implies, bears its flowers close to the twig, so that the acorns are without stalks. In this variety the buds are also more prominent, and the branches more upright, while the leaves remain on the tree later in the winter.

The species of British Oak has been so much crossed that it is difficult to find a tree which has all the characteristics of either the

Pedunculata or the Sessiliflora tribe, even when the general differences are fairly well marked.

The Oak is of exceedingly slow growth, reaching maturity in the one-hundredth or one-hundred-and-twentieth year of its age, and living for five-hundred years or more, while specimens about which historical data have been collected, are even known to have lived over one-thousand years. In old trees the size of the bole becomes immense, in some specimens measuring 40 feet in circumference at about a yard from the ground, while the spread of the boughs beyond the trunk will attain to a distance of 15 yards. The Oak prefers elevated ground free from stagnant water, and a clay soil. On high ground it is more stunted than when grown on low ground. Like most forest trees it bears its barren flowers in catkins, and the pistil and stamen-bearing flowers upon different branches of the same tree.

The barking and stacking of the felled trees is the most interesting of the rural scenes connected with the Oak. This is done by the women and children of the woodmen, whilst the ground is sweet with bluebells and primroses. In the autumn the herdsman still tends his swine amongst the acorns, as in Saxon times.

RAMIFICATION.

The ramification of the Oak is well marked and varies but little in different specimens of the common species. The massive spreading boughs usually spring from the stem at a short distance from the ground, almost at a right angle to the trunk. Growing in a horizontal direction, these again give out other boughs, wonderful for their number and the variety of their twists and turns. It is this branching-out of the stem into many boughs, the interweaving of the

branches and twigs, and the compactness of the foliage, that give to the top of the tree its bushy look. Its rounded outline, only broken by projecting star-shaped bunches of foliage, is partly due to the great distance to which the lower limbs spread,* and makes it easy to recognise the Oak at a distance. When seen nearer, the gnarled bifurcations, and the rough sections of the bark, covered with grey-green lichen on the massive trunk add further distinguishing points.

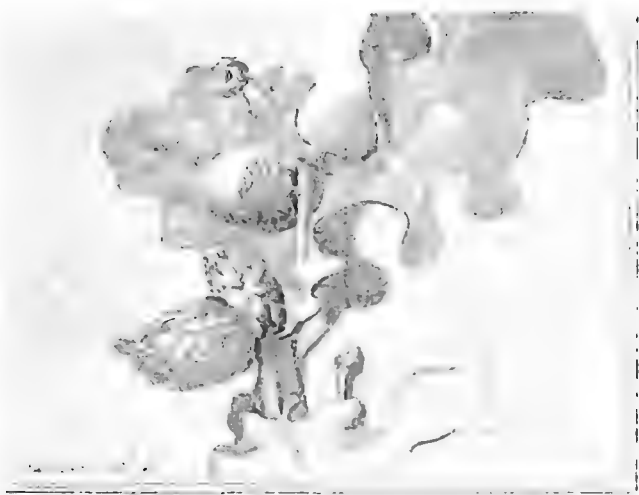
But, in the study of trees, it is necessary to look at the smaller branches and young shoots to obtain a clear idea of the mode of ramification. As a tree becomes older the growth of its parts is much influenced by its surroundings. A branch may take up an unnatural position in order to obtain light and air, or, for want of these, may become deformed, or die away and leave an unsightly gap. But in the young spray we find the typical method of growth very little impeded, and can thus learn to account for departure from it in the full-grown tree.

In the Oak the likeness between the ramification of the new shoots and twigs and that of the larger branches is very apparent. We find that the twigs divide at a right angle, or nearly so ; also that the second year's shoot commonly takes an opposite direction to the shoot of the first year, while two shoots springing from the same node are usually of unequal length. We find three or four buds clustered on a spray, which accounts for the subsequent interwoven appearance of the branches, while their horizontal position is partly due to the fact that the shoot rarely starts from the under-side of the branch.

*The outline of the whole tree often forms a semi-circle owing to the lower boughs spreading to a distance nearly equal to the height of the tree.



RAMIFICATION.



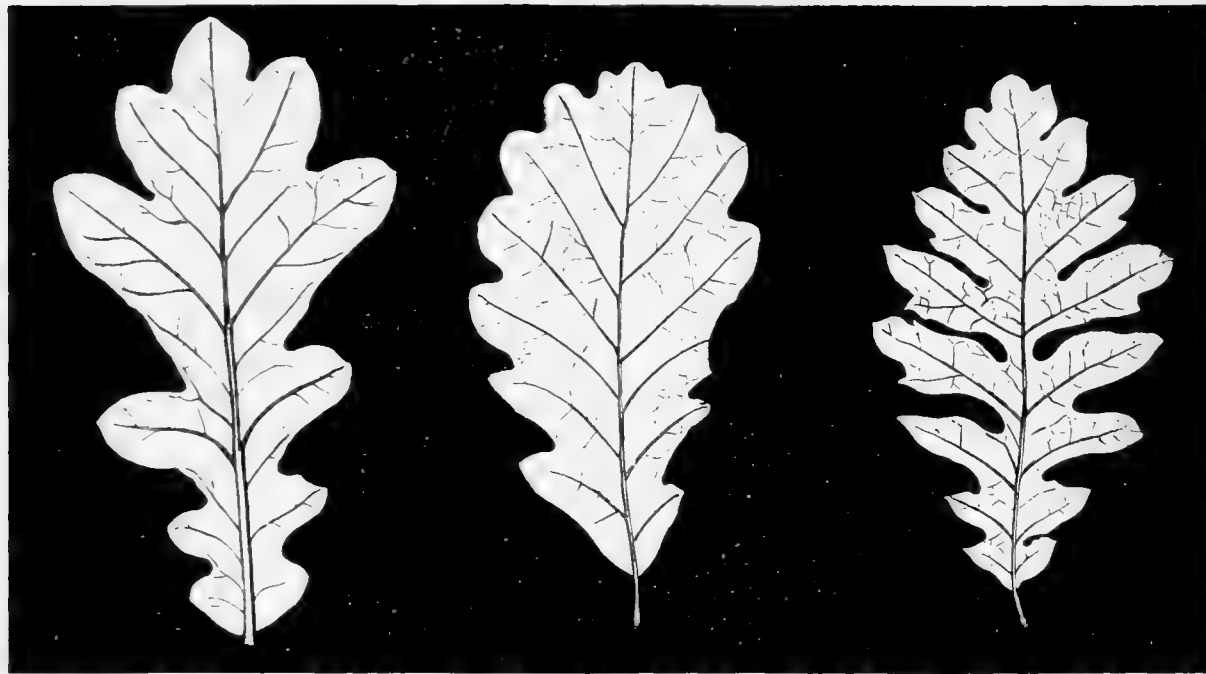
ACORNS.

(Notice the Artichoke Galls in the smaller drawing.)



THE LEAF.

The leaf of the Oak varies in size and form in the two species, as well as in individual trees. The leaf of the *Pedunculata* contributes to the rugged look of the tree, being contorted and waved at the edge. It is oblong in shape, and from two to four inches in length. The edge is divided into several lobes, irregular and rounded, the divisions between them cutting into the leaf about half way to the central rib. The leaf is covered with a network of veins, the larger ones being very noticeable on account of the waviness of the leaf. The leaves have hardly any foot-stalks. The distinctive features of the leaf of *Robur Sessiliflora* are its larger size, more



PLAN OF OAK LEAVES.
(No. 1 may be taken as the type.)

regular shape, and less wavy surface ; its lobes are more obtuse and foot-stalks longer. The blade is also more glossy and brighter in colour. Oak leaves in spring are of a brownish-pink and exceedingly glossy ; later they change to pale green, and become darker and duller as summer comes on ; brown is their autumn tint, and they remain on the tree till late in the autumn or winter.

The withered foliage is retained for so long a time owing to the fact that the leaf is not articulated. The difference in the construction of the stalk of an articulated leaf, which forms an angle with the twig, may easily be seen by comparing the leaf of the Oak with that of the horse-chestnut. As a rule also, articulated leaves take on brighter colours before they fall than those which are not articulated.

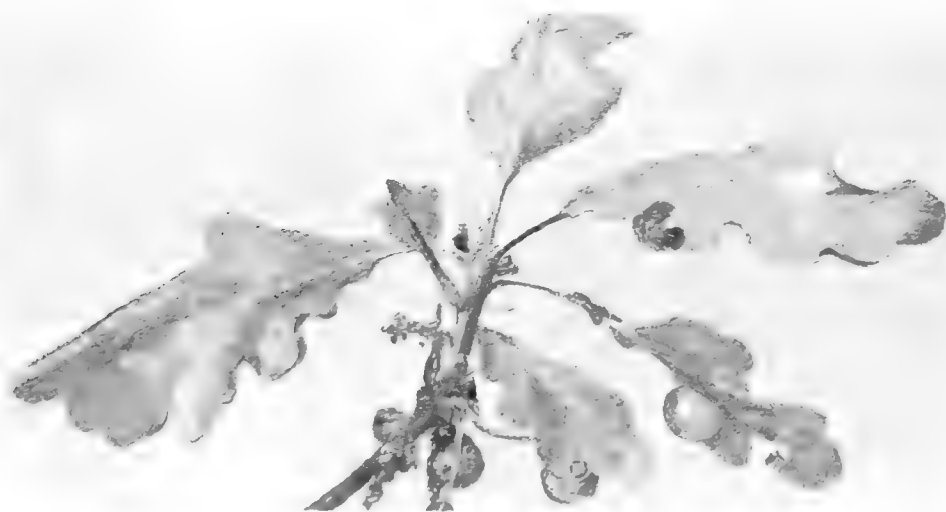
It is interesting to notice the shape of the bud and the method of expansion of the leaf upon different trees. In the Oak bud the two sides of the leaf are folded together at the main rib. The leaves are arranged alternately on the twig in sets of five, that is to say, the sixth leaf is in a straight line above the first on the stem, the seventh above the second, and so on. A spiral line taken round the stem would have to encircle five leaves before it would arrive at one directly over the leaf it first started from.



EXPANSION OF FLOWER AND LEAF BUDS.

OAK GALLS.

At certain times of year the appearance of the tree is frequently altered by the work of the various insects that make a home in it.* Some of these, of the order Cynipidae, form the brown woody "marble gall" the rosy polished "oak apple," the "crimson spangles," and the "artichoke" gall. These gall-flies puncture the young shoots and leaves, and especially the male catkins, in order that they may deposit their eggs, and round the wound the sap accumulates, and forms the gall. In spring-time the semi-transparent galls called "crimson spangles," often cover the pendulous catkins, giving to them much the appearance of a bunch of red currants, and are sometimes so plentiful that from a distance the whole tree appears to be tinged with pink.



LEAF GALLS.

*The larvæ of nearly 70 insects live in the Oak; a list and short account of these is given in "Woodlands, Heath, and Helges." W. S. Coleman.



"OAK APPLE" AND "CURRANT" GALLS ON THE FLOWERS.



THE LEAVES IN WINTER. TWO FORMS IN GALLS.



THE WHARFE BELOW BOLTON ABBEY

[ROYAL ACADEMY, 1904]



THE HAWTHORN.

GENERAL REMARKS.



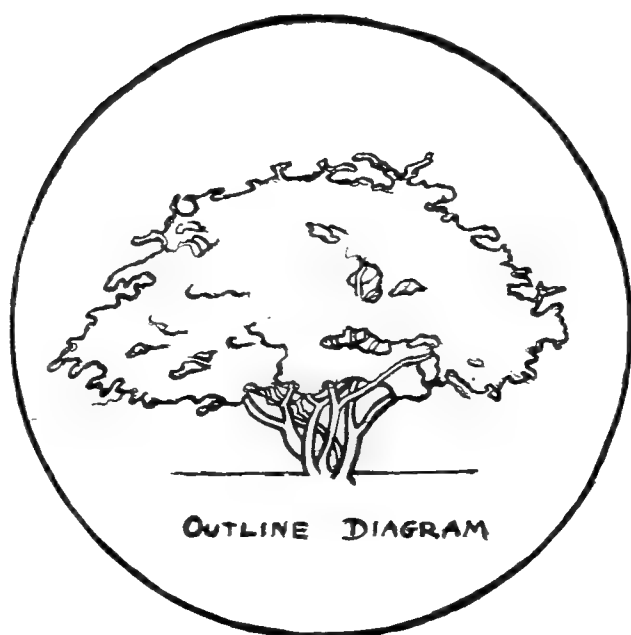
AN English hedgerow—a hedgerow in the spring, when elder tree and willow have already given note of the season in catkin and swelling bud—a hedgerow in June, girdling with a belt of fragrant white Hawthorn some buttercup meadow—a hedgerow where the birds build, and their young ones first hop and twitter, where insects hum, and beneath which wild flowers and long grasses grow in careless and tangled profusion—it is of all others a place about which to linger and observe some of the countless phases of plant and animal life. For

one thing, one may study there the various ways in which insect habit affects the appearance of bushes and even of timber trees. A silvery web covering bird-cherry or goat-willow is the shelter of countless grubs; the beautiful crimson bedeguar of the rose-bush is the handicraft of gall-flies. These insects especially affect the oak tree; they cover and almost conceal its catkins with currant-like galls, set their studs upon its leaves, and produce "oak-apples," round woody galls and artichoke galls, upon its branches, in sufficient numbers to alter the appearance of the tree. The pine-galls, so closely resembling young cones, are hardly less conspicuous, and the leaves of the Willow and the leaf-stalks of the Black Poplar fall victims to the same pest. The young shoots of the Limes are sometimes forced into a curve by the punctures of a species of aphis. More noticeable than any of the foregoing are the knotted woody masses which form round the twigs of willows; they resemble the "birdsnest" excrescences which disfigure the Hornbeam, Birch and Thorn, though these last are probably due rather to excess of nourishment in the soil than to the puncture of the young shoots, as in the first-named tree. The shoots of the Hawthorn are sometimes attacked by a grub, and a kind of leaf-gall is produced, in the form of a mass of small prickly leaves surrounding a ball of withered ones in which the insect conceals itself.

An abnormal form or position in a leaf often indicates that a caterpillar has taken possession; some may be rolled up from tip to base, others from side to side, or the two layers of the leaf-blade may be split, and a tunnel forced between the two fragile walls. The gum exuding from insects alters the texture of the leaf, while lichens, vegetable parasites of varied form and colouring, are often more conspicuous than the bark to which they cling.



OLD STEMS.



RAMIFICATION.

Though the Thorn will live anywhere, its growth is much influenced by its position, and differences of situation have produced two distinct types. When planted with other trees in a sheltered spot, it becomes an elegant and free-growing tree, of from 30 to 40 feet in height, with a fairly straight stem; the lower boughs are pendulous, and slender branches project from the rounded top. In exposed positions, however, it shows more interesting characteristics.

The grey stem, knotted and scarred, and bulky considering the height of the tree, rises from roots which show above the ground. This stem, itself spirally twisted and rarely straight, soon ramifies, with a full curve into stout limbs, so modelled that they strongly recall the muscular construction of animal forms.

Crossing and re-crossing one another, and repeatedly twisted, they give off horizontal boughs, much interlaced and varied by un-looked-for angles and turns in unexpected directions; these spread from the stem to a distance that often exceeds the whole height of the tree.



Rounded and broad in proportion to its height, this type of Hawthorn appears as a dense, stunted tree, some twelve to eighteen feet high. The natural grotesqueness of its stem-growth is often increased, in early stages, by the pruning knife, and the presence of numerous suckers. Arrested development in the twigs is indicated by the spurs, and this, together with the production of lateral branches of blossom, affords an explanation of their matted appearance. The numerous twigs are thickly coated with leaves and thorns, and long shoots, bent by the weight of blossom and leafage, project from the matted bulk.



HAWTHORN BRANCH
IN WINTER.



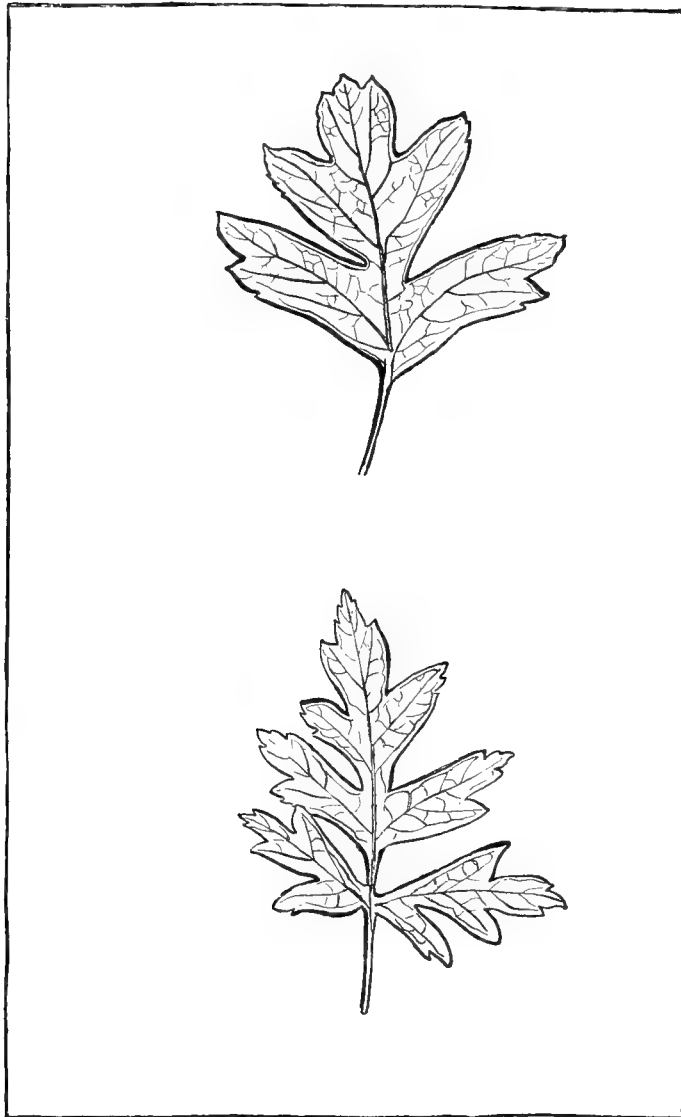
DECORATIVE THORN STEMS.



STEMS.

THE LEAF.

The leaf-bearing twigs vary in colour from purple-brown to grey on the sides less exposed. The buds, radiating from all sides of the



twig, are fairly close together. Early in spring the pink scales which enclose them separate, and they appear as little balls of whitish-green. The clustered tips of the leaves soon spread away from the new shoot, now rapidly lengthening, which supports their petioles, and a leafy rosette is formed, tapering towards the base where the bud scales still adhere. The upward direction of the new shoot now changes to one at right angles with the parent twig, and its crimson colour can be seen between the opening foliage, a colour which is also traceable on the under-

side of the leaves, and on their petioles. Stipules, leaf-like in form, grow at the base of the shoot, and others of more slender construction are found in pairs at the base of each leaf-stalk. The young

leaves are glossy in texture, and vary in colour from crimson or yellow to fresh green. Groups of from five to seven leaves stud the older twigs; their stalks radiate from the point of junction between the twig and a thorn, and one, or more, of each group is usually much smaller than its companions, even when fully grown.

In summer the leaves take a darker tinge of green, and by September have begun to turn crimson. A typical form of leaf is given in the diagram, but they are found in very great variety; in some cases the indentures of the leaf-blade nearly reach the mid-rib. The primary and secondary ribs only are conspicuous, though the leaf is reticulated with a close network of smaller veins.

THE FLOWER.

The flower-buds grow at the extremity of the new shoots, and are round, small and green. The flower is made up of five white crinkled petals and five sepals. There is a central pistil, and three stamens are found opposite each petal, with a single stamen between the petals. When fully blown the petals are often tinged with pink.



These abundant stamens, with their pink and brown tips, give colour to the blossom, and it should be noticed that masses of flowers with long and numerous stamens have a blurred and indefinite appearance, even when seen from no great distance, as compared with those possessed of few or short stamens; in this respect the flowers of the Hawthorn, Mountain Ash, Guelder Rose, White-beam, &c., should be studied.

The florets are borne on tertiary stalks from two to four in number, springing from secondary ones, numbering three or four, which arise from a common foot-stalk.

THE FRUIT.

The berry or haw varies in outline from spherical to bluntly oval. From green it changes to scarlet, and finally to a dull crimson, by which time it has lost its hardness though it does not become pulpy like the fruit of the guelder rose. It contains, one, sometimes two, pips or seeds. These do not germinate until the second year after ripening.

THE HAWTHORN (*Cratægus Oxycantha*).

The young plant grows rapidly, making from six to eighteen inches in the first year. This rapid growth is not maintained though compensated for by a long and hardy life. It appears to prefer soil where lime is present in some quantity. The young plants for hedges after the first year are termed "quicks," in some parts a quickset hedge is termed "wicken." The tree is also known by the names Whitethorn, Thorn, and May.





APRIL
1915

THREE STAGES IN THE DEVELOPMENT OF LEAF AND FLOWER BUD.



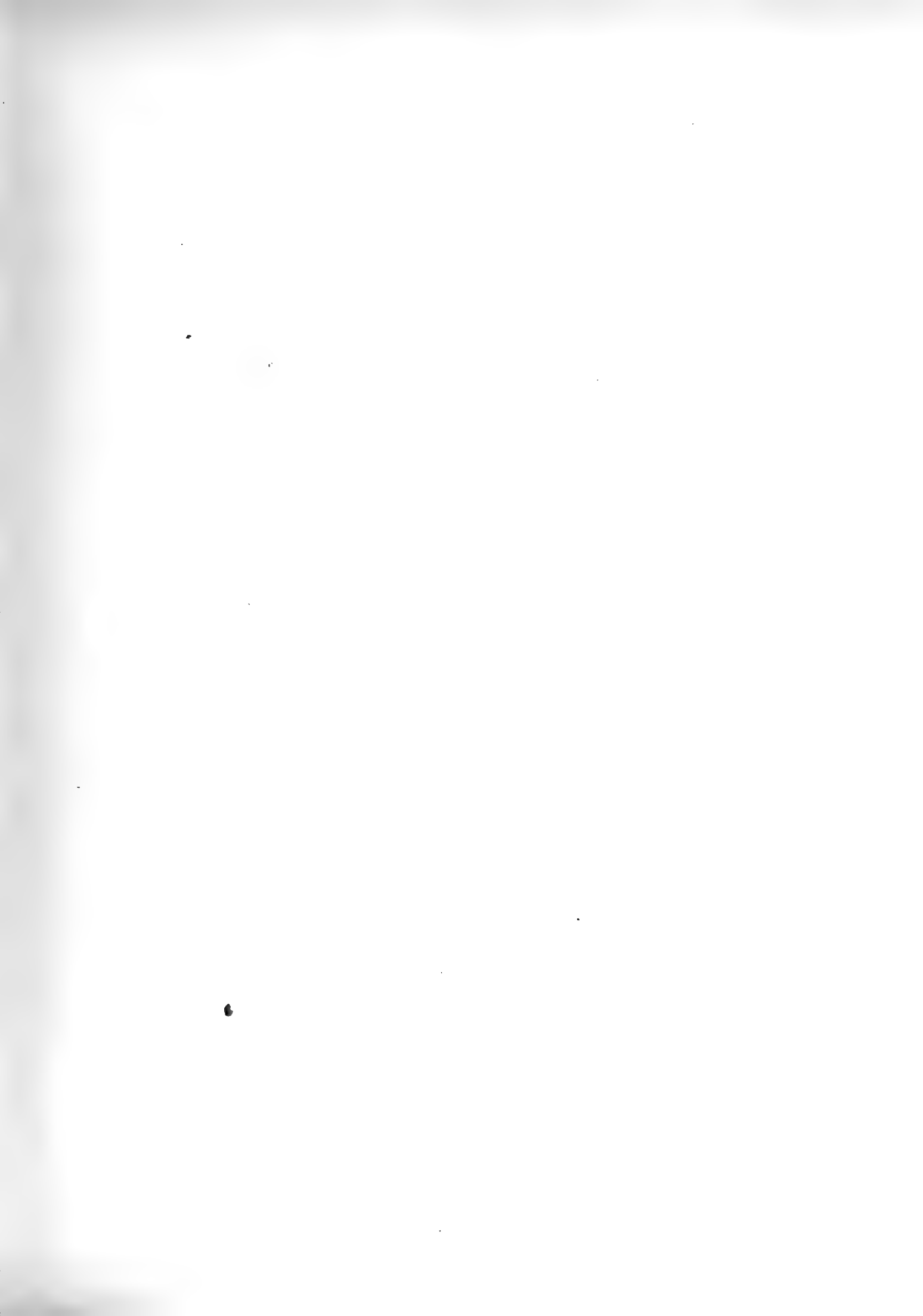
FURTHER DEVELOPMENT OF THE LEAVES.



BRANCH OF BLOSSOM.



HAWS.





THE HORSE-CHESNUT.



By permission of Col. the Right Hon. W. Kenyon Stanley, M.P., the owner of the picture.

THE HORSE-CHESTNUT.

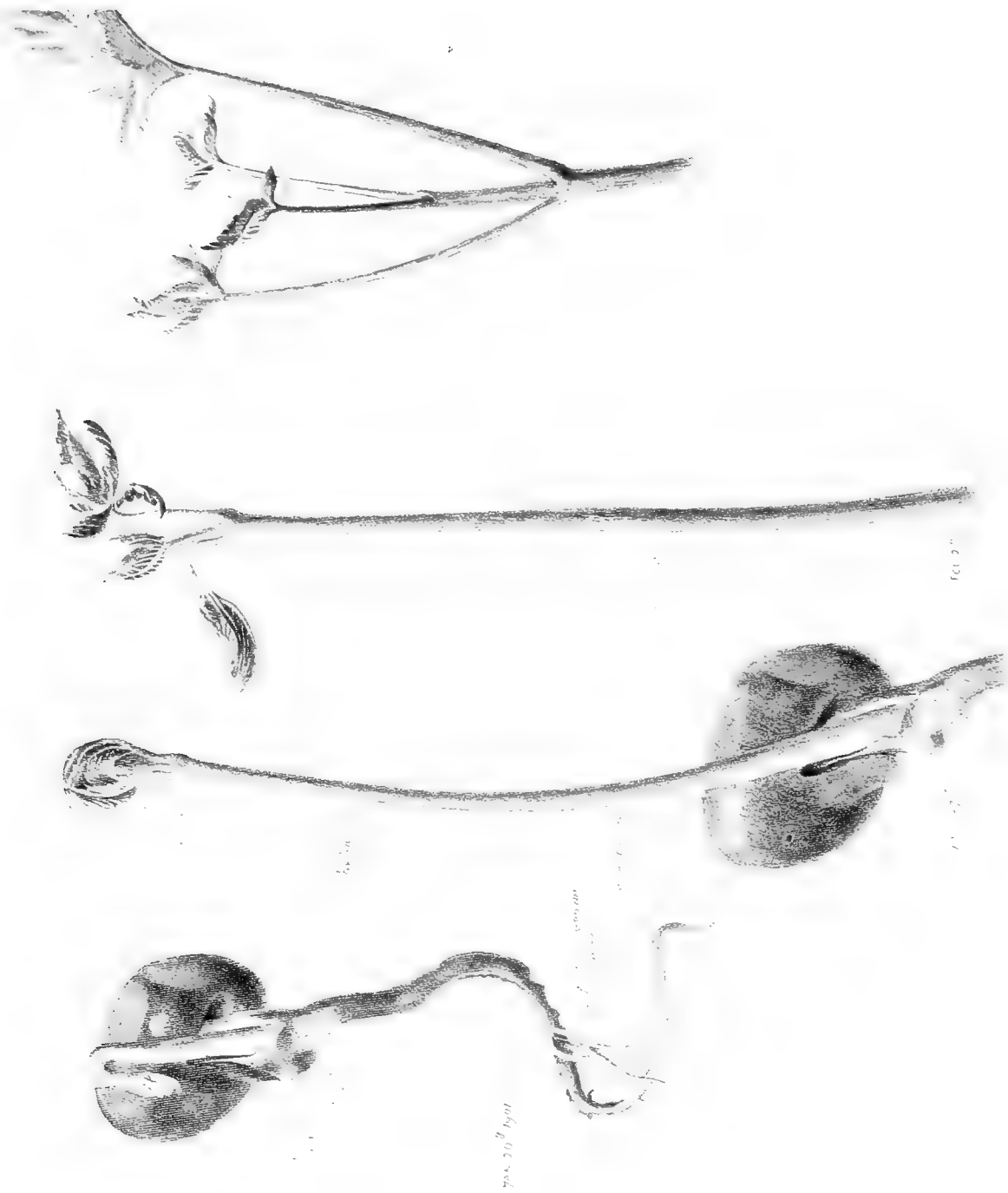
GENERAL REMARKS.



WITH the Horse-chestnut one seems to come out from the woods, with their tangled undergrowth, their dimmed light, their interlacing boughs, and to pass across open park land, intersected with shady avenues, or by groups of stately trees standing on broad stretches of turf.

The whole character of the Horse-chestnut is in keeping with such surroundings. It is, as one might say, the aristocrat among trees, and in all respects on a grand scale; there is lavish profusion and luxuriance about its manner of growth, and at the same time perfect symmetry, and an almost geometrical precision in the arrangement of its parts. In spring its huge sticky buds, bursting with vigorous life, throw off numbers of well-arranged scales. Each single leaf is above a foot in length, and composed of seven radiating leaflets. These great leaves group themselves regally round the tall slender cones made up of many flowers; one looks up at rank above rank of massed foliage and countless pyramids of blossom. The ground beneath is presently carpeted white with the fallen petals, and the tree bears a new and luxuriant burden of fruit, more than it can ever ripen by so much as would lay the foundations of a new forest. Yet in spite of this abundance, one might indeed say in order to arrive at it, every stage of growth is guarded with protective care. The young leaf is shielded from the cold, while in the bud, by an inner coating of wool and gum-covered scales which lengthen with it as it emerges. So long as it is young and tender its component leaflets droop to prevent excessive transpiration. The leaf-stalks are placed on the shoot in such a way as to enable each leaflet to obtain the maximum of light and air, while the greater length of the lower ones provides that the leaves they bear may not be screened from the sky by the upper tiers of foliage. The young flower too has its woolly covering and the fruit a thick spiny husk.

The herds of deer which roam in our parks feed on the nuts, and in early summer cockchafers, with their loud whirring wings, swarm among the Chestnut branches.



THE YOUNG CHESTNUT AS IT FIRST GROWS.

THE YOUNG CHESTNUT TREE.

The drawings on page 149 explain the early stages in the life of a Chestnut. The first figure shows the nut with the descending axis some four or five inches long already furnished with well-formed rootlets. The ascending portion, of slower growth, is but an inch up, though its recurved tip bears the first set of true leaves. This young stem has not been able to split the nut and spring up between the two seed-leaves (cotyledons) that make up the nut, like the young oak does with the acorn. The Chestnut seedling in this resembles the walnut, though in the latter the seed-leaves seem more nearly to merit their name. On either side of the axis are the connections by which nourishment is conveyed from the seed-leaves to the young plant. The straightening of the stem, its growth and that of the first leaves is explained by the figures that follow on.

THE LEAF AND ITS DEVELOPMENT
FROM THE BUD.

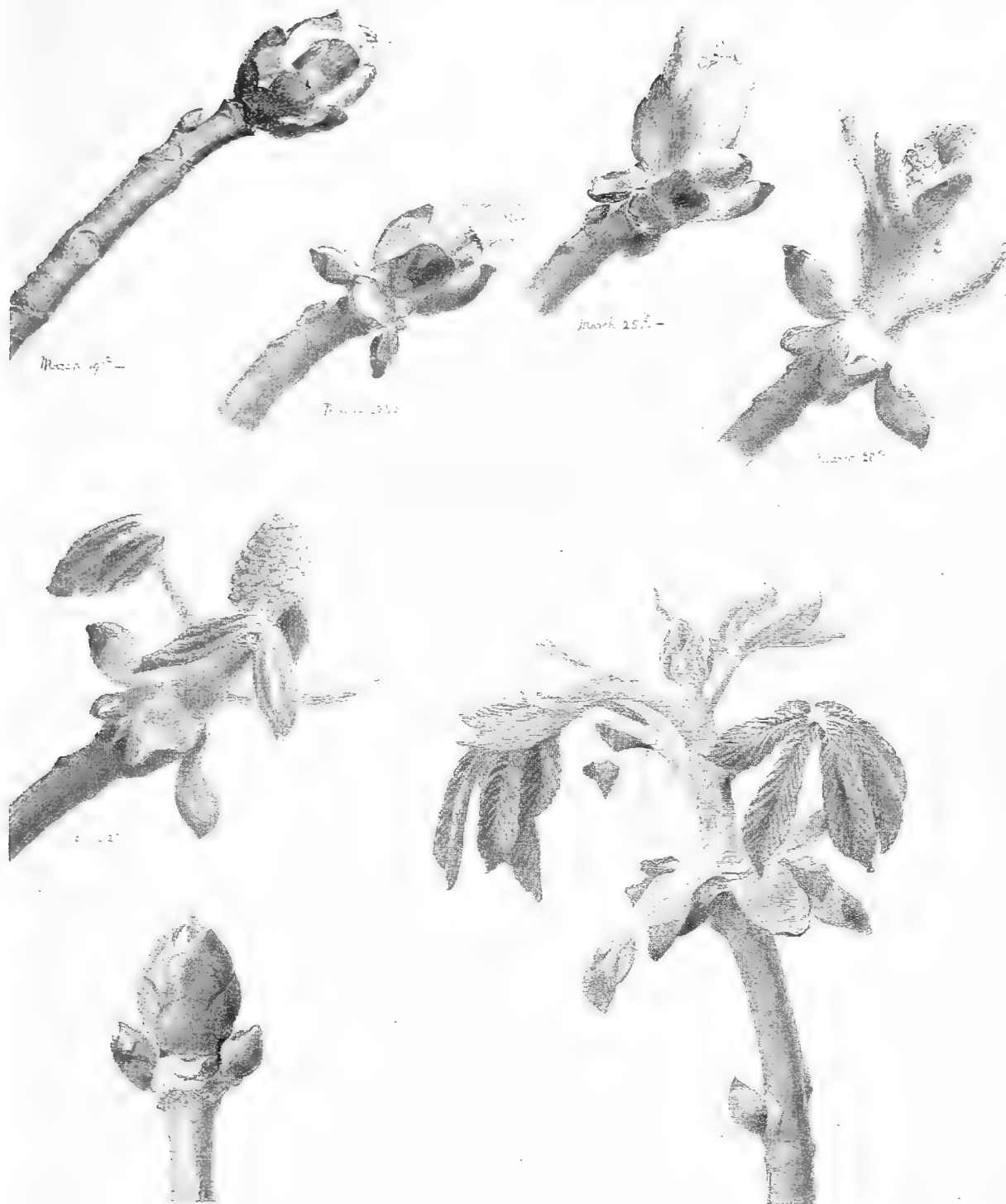
At the end of the winter each of the pale red-brown shoots of the previous year is topped by a stout bud nearly an inch in length. Within it, concealed by the sticky, overlapping chestnut-coloured scales, lies the future flower and its coronal of leaves. As the gum on the bud is melted by the sun and warm rains of spring, the scales lengthen, and the whitish-green of the parts hitherto unexposed is seen. The outer and lower scales separate and droop backwards towards the stem, while the leaf tips, coated in white fur, emerge beyond the lower ones, which are pale and beautifully tinted with pink. Each leaflet is folded at the central rib, and the leaves lie like a closed fan, the older ones protecting the smaller, as well as

the fur-covered cone of the flower-bud, which lies in the centre of all. These last continue their growth in an upward direction, even after the lengthening petioles of the outer leaves have brought them to a more horizontal position, and their upper surfaces, with the strongly marked ribs, are shining a bright green. The new stem, also of a brilliant green, is at first almost hidden by the white wool, which either envelopes it or is stretched like a cobweb from stalk to petiole, covering the underside of the leaves.

The growth of the flower-stalk has meanwhile set spaces between the florets it bears, and the segments of the older leaves flatten out and then spread away one from another. The less fully-developed leaves droop till they form a miniature tent with the stalk for a central pole. This position, like the upright one assumed by young beech leaves, serves to prevent excessive transpiration.

The young shoot continues to grow throughout the summer till it is from twelve to eighteen inches long : it bears ten or twelve rich green leaves, connected with it by bright green leaf-stalks eight or more inches in length, and arranged in opposite decussate pairs.

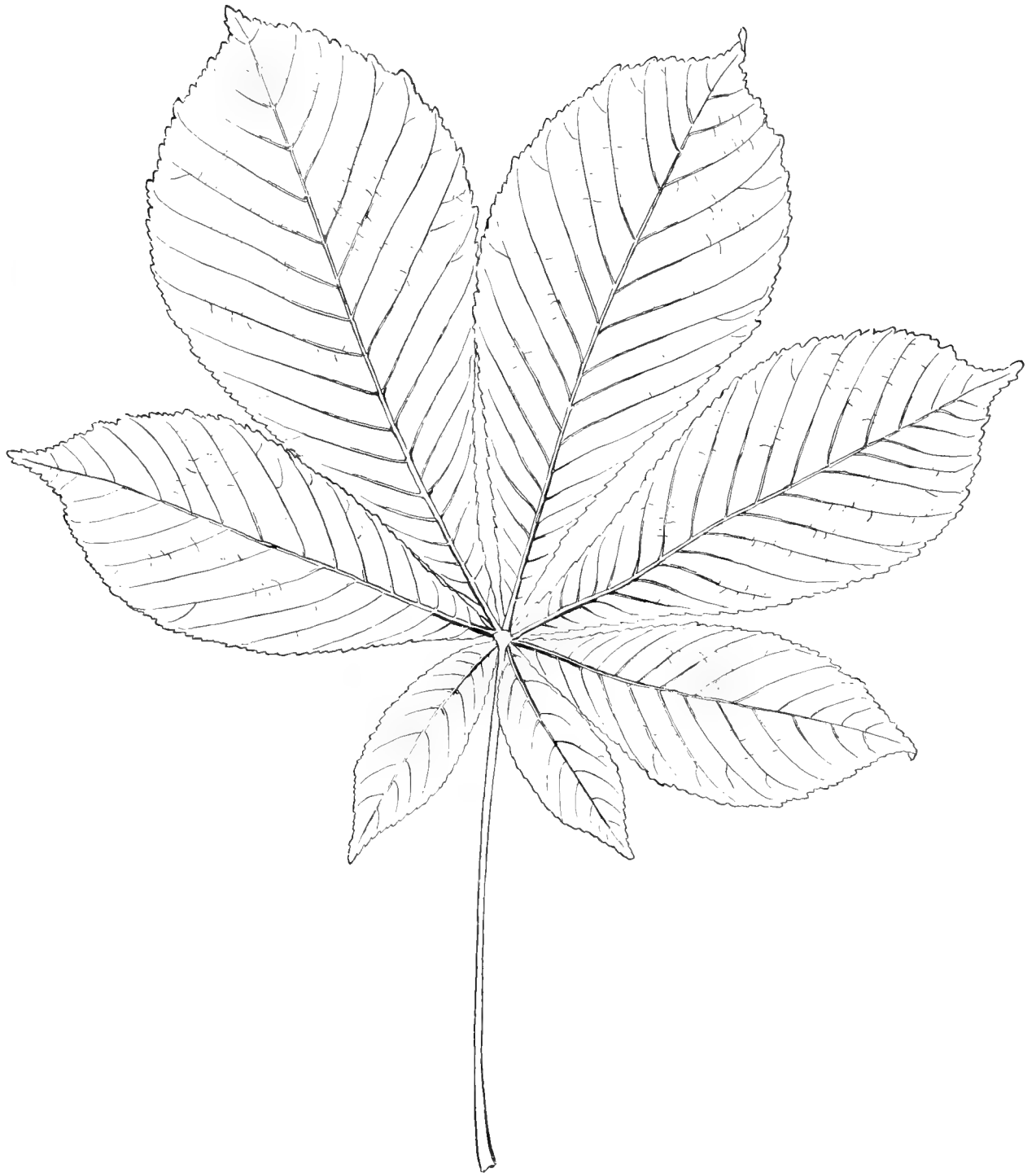
At the point of union the pairs of stalks almost encircle the shoot, whilst a hollow on the upper surface of each, at the same point, forms a snug hiding place for the new bud. With the exception of this hollow the stalk is rounded in shape and set on the shoot at less than a right angle, bearing the leaf in a horizontal or but slightly drooping position. The seven pear-shaped leaflets have clearly drawn ribs on both upper and under surfaces ; they radiate from the stalk in straight lines, a habit of growth which is not found in the leaflets of any other tree, though such lines may sometimes be traced in the lobes or the ribs of single leaves. The lateral buds resemble the terminal, except that the absence of a



SEVEN STAGES IN THE DEVELOPMENT OF
FLOWER AND LEAVES FROM THE BUD.
(The five upper figures were drawn from one bud as it opened.)



THE POSITION OF THE LEAVES BEFORE EXPANSION.



PLAN OF LEAF REDUCED BY HALF.

flower-cone reduces them in size. As a rule the leaves appear early in the year, and fall in early autumn, but, as with other species, individual trees may be noted which habitually come into leaf sooner or later than their fellows. In autumn the leaves take on tints of red and yellow, which appear to be brightest in the neighbourhood of water.

THE BRANCHES.

The twigs which are few in number, and do not interlace, are conspicuous by their stoutness. They are dotted over with lighter-coloured spots which indicate the breathing holes of the inner bark ; while in the winter, under each pair of buds are scars, the shape of a horse-shoe, which show where the leaf-petioles of a former season were articulated. The regular arrangement of the buds does not result in any very regular growth of the branches, for the shoots are often not continued by the true terminal buds but by a pair of lateral ones forming just below it, and of these one commonly dies back. In order to support the leaf-petioles the twigs must be vertical, or nearly so ; consequently boughs which have become pendent compensate for this by curving upward at the tips. The curves are in strong contrast to the sharp angles formed by the twigs. The central branches spread to the longest distance from the trunk, making the circumference of the tree greatest at half its height from the ground.

In old trees the weight of the lower boughs bend them to the earth, where they remain and again send up branches in a vertical direction ; in grazing lands, however, this, the natural growth of the lower boughs, is in many cases destroyed, and seen from a distance the base of the tree forms an even line, parallel to the ground, just

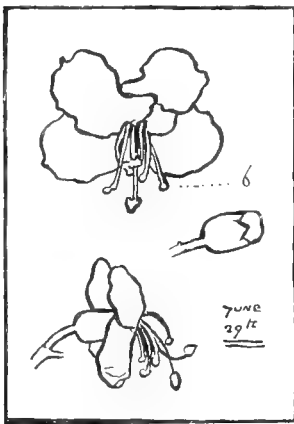


ARRANGEMENT OF THE BUDS.

at the height to which animals sheltering beneath it would reach. The furrows in the bark run in spiral lines round the trunk though they are scarcely so marked as in the sweet chestnut.

THE FLOWER AND NUT.

The growth of the young head of flower has been already described. By the end of May it is in full blossom. The thick



upright stalk, some six or seven inches long, is green partly covered with brown pollen. It bears at intervals and alternately, smaller stalks, the lowest and longest set at right angles to it, the upper ones, in succession, at more acute angles. These secondary stalks bear from three to five other and still smaller ones, clustered near the tip. Each of these last supports a floret.

The lower florets of the spike are fully out while the pedicel is still capped by a mass of blunt oval buds of dull pale green. Every floret has five (sometimes four) petals, springing from a cylindrical calyx tube. The petals are velvety white and are bent backwards so that they display the delicate pink and yellow tints of the centre, which is occupied by a white tapering pistil and curved stamens tipped with salmon-coloured pollen-cases shaped like an arrow. The sepals number five, and are small and pale green. Usually there are seven stamens, sometimes six.

Only a few of the numerous florets bear fruit. The fertile ones, before the head of flower has faded, display the future nuts in the form of pale green or white ovaries which protrude from their centres. By the middle of June the fruit is about half-an-inch in diameter and covered with soft white hairs: by the autumn these

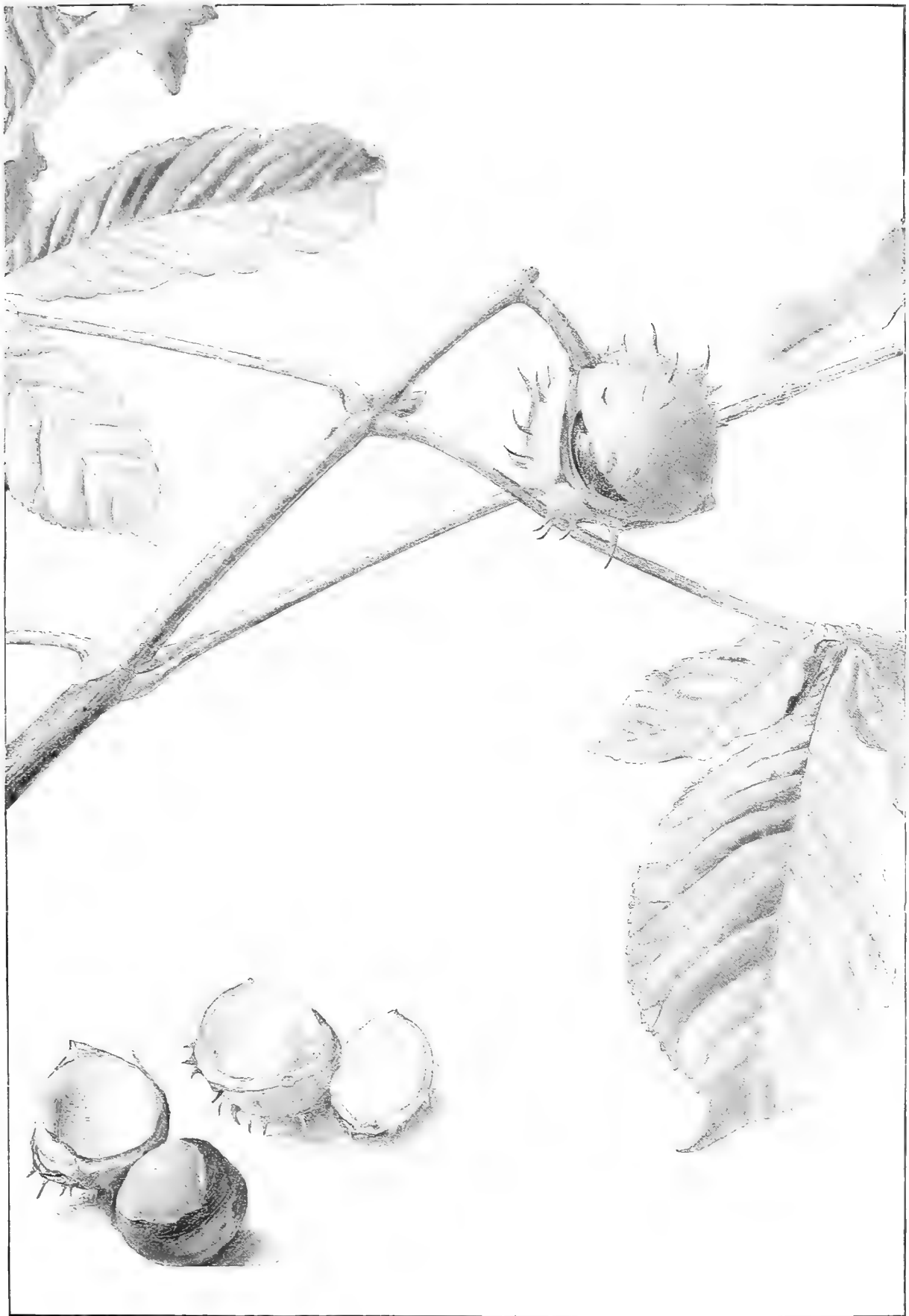
are transformed to hard prickles, standing out from a tough green husk which measures about two inches in diameter. The weight of the nut now makes it pendent, and the husk begins to split up along the indented lines that run from top to bottom and divide it into three equal segments. Each of these has an inner lining of white skin into which the polished Chestnut is neatly fitted: only in very rare cases, however, do the nuts in all three segments come to maturity.

THE HORSE-CHESTNUT (*Æsculus Hippocastanum*).

The Chestnut appears to have been brought to Europe from Asia in the middle of the 16th century. It will grow to fifty or sixty feet, and that very rapidly, in a rich loamy soil, and does well in almost any situation. The wood is soft and not particularly durable. It has an even grain. The tree, however, is planted merely as an ornament, and the grand formality makes it specially suitable for avenues. It is but little affected by frost, wind, or the ravages of insects. In some districts the seed is apt not to set, and the young foliage to be disfigured by late frosts. It can withstand a strong wind as it is furnished with a vigorous tap root, and rootlets spreading laterally. The branches are sufficiently tough to prevent much damage resulting from the deposit of ice or snow.



FLOWER AND FOLIAGE REDUCED TO HALF THEIR ACTUAL SIZE.



NUT READY TO DROP FROM THE SPLIT HUSK.
(These forms in nature would be about one-third larger.)



BRANCH BEARING FLOWER.
BRANCH BEARING FRUIT.



THE GUELDER ROSE.



THE GUELDER ROSE.

GENERAL REMARKS.



INDIVIDUALITY in a tree does not by itself constitute beauty, but a tree possessing strongly marked characteristics is always interesting. At all times the growth of the Guelder Rose offers certain note-worthy features, and for each season of the year it reserves some distinctive development. The opening flowers and buds are particularly decorative in character: florets of two distinct forms and shades of colour make up the head of blossom, while the foliage, unlike that of any other forest tree, shows two separate types. The shape of the stipules and of the leaf petioles, and an unusually constant method of ramification mark it out from all other species. It can, however, claim its measure of beauty as well as of distinction. Its crowns of blossom are whiter and more shapely than the loose clusters of the Elder-berry growing beside it, and its leaves, large and clear-cut, make fine patterns against the indefinite undergrowth of the hedgerow. In autumn, when the glory of its purple-red foliage has faded, clusters of scarlet berries still hang about the stems of mealy-grey, and linger on to lighten the sombreness of the copse in winter.

RAMIFICATION.

The buds on the Guelder Rose vary in size, as greatly as the twigs which bear them. The twigs are either tipped with a pair of knob-like buds, or carry one large bud flanked by two smaller ones at the apex, while lower down are found one or two pairs of opposite lateral buds, lying close against the axis.

It has already been explained that in some trees the terminal bud does not develop, but the growth of the twig is continued by the lateral buds; and again that the development of a flower stops the further growth of a twig at that point. In the Guelder Rose it is usually the terminal bud which produces a flower and exhausts itself in the effort. Hence the branches often end on a **V**-shaped fork, with the withered flower-stalk in the angle. Sometimes one twig of the fork dies and the remaining one forms an obtuse angle with the parent stem (**Y**). Or again, the whole upper portion of the shoot dies back and growth is continued from the lower part. Thus, in spite of the formal grouping of the buds, the general arrangement of the branches is singularly irregular both in angle and direction.

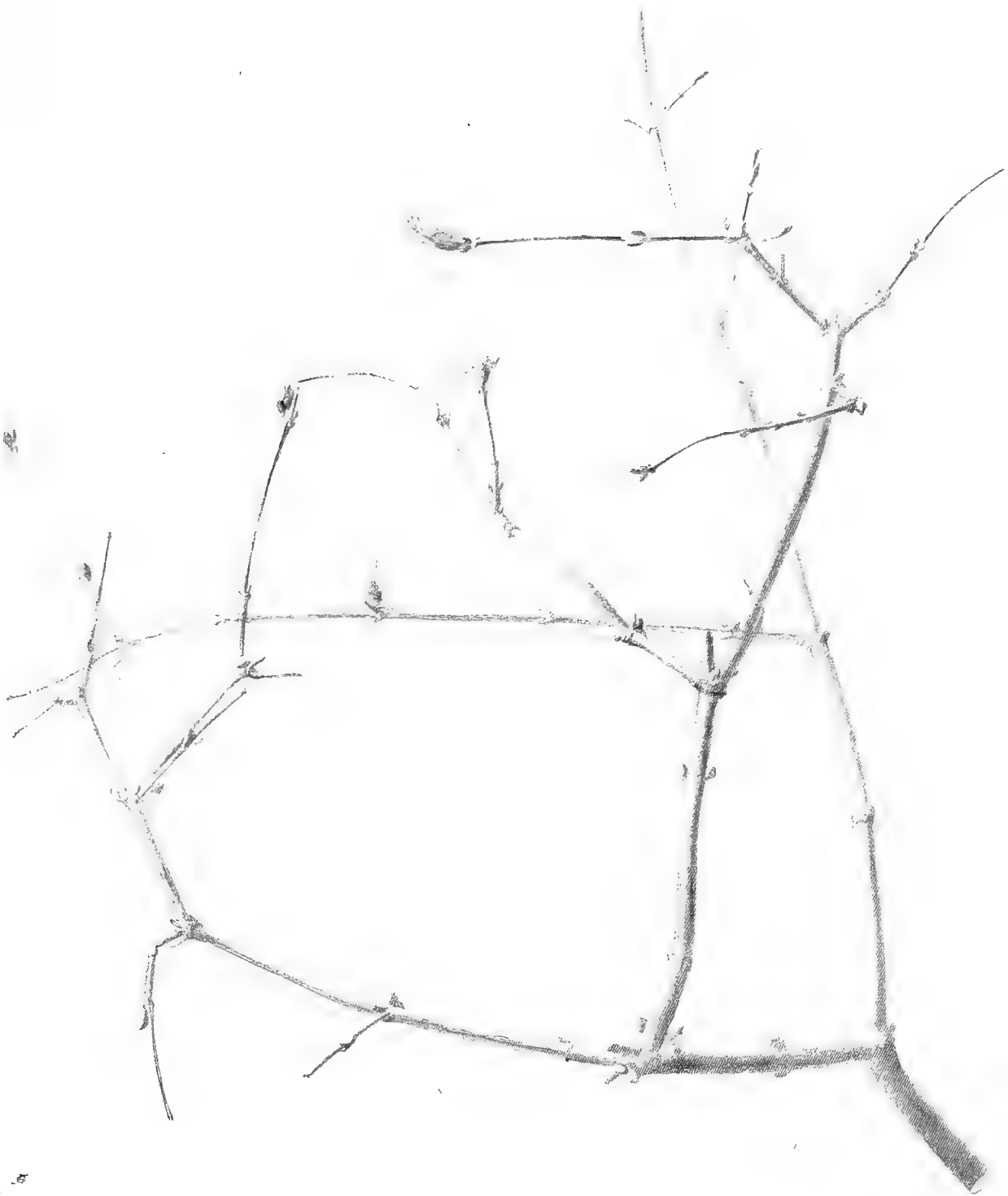
Round the stumps from which twigs have fallen away new buds form, and the enlargement at the nodes which results from this is another distinguishing feature of the species. The manner of growth just described is chiefly noticeable in the smaller branches, the main stems often continue to some height in an unbroken line, the terminal bud having, in this case, carried on the upward growth. The lateral buds wither away, but the bareness of the lower stems for some distance above the ground is partially concealed by the young plants springing up on all sides.



FRUIT-BEARING-SHOOT IN WINTER.



This drawing is of a
branch of a tree
which has been
found in the sea, in
the month of



A BRANCH IN EARLY SPRING.

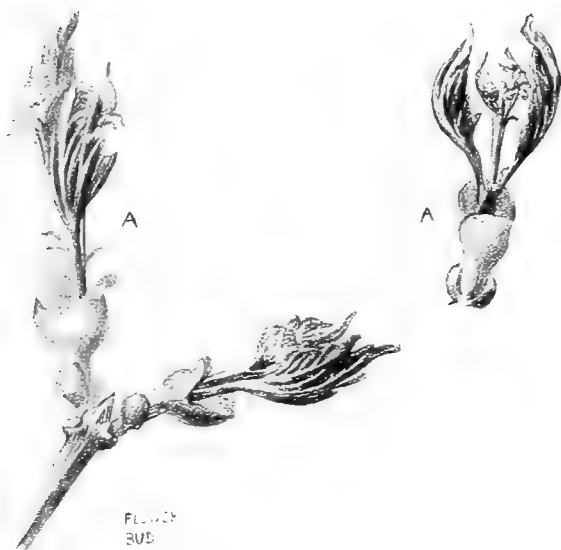
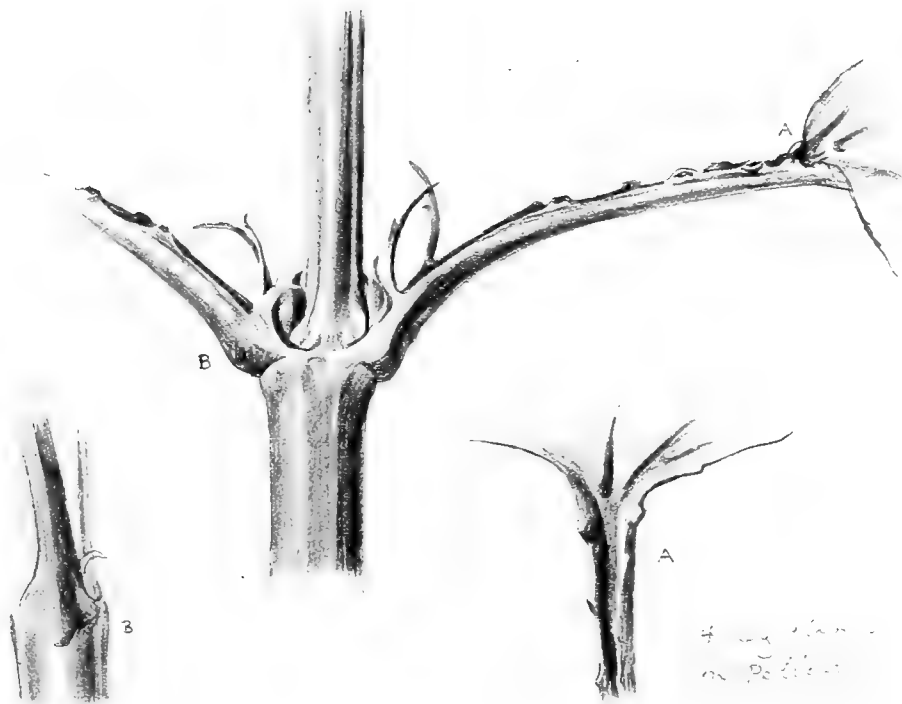
(Showing how the Branch system is altered by the death of the central, or side, branchlets.)

DEVELOPMENT OF THE LEAF AND FLOWER

In winter the bud is protected by a pair of scales, brown-red with a polished surface. In springtime this outer sheath divides into two halves, which only adhere at the base. Towards the end of April the leaves push out at the apex of the bud, each leaf as it emerges being folded together at the ribs. At first only the outer pair of leaves are apparent; the main rib of each takes a bow-shaped curve, and the blades lie wrapped protectingly over the inner pair.



For a time the stipules encircle each foliage-cluster like a pale green cup, but as the leaves develop they too lengthen and fall apart. Meanwhile the inner pair of leaves remain nearly upright, the outer ones, still crumpled, falling away from them like an open fan. In colour the young leaves are pale green, sometimes tinged with red, with a gloss on the upper surface which is lost later in the season. The form of the opening flower-bud is very beautiful. From a circlet of protecting leaves, which themselves radiate from the cup-like inner scales, the pale green heads of flower spring slender and erect. The scales of the flower-bud are larger and fuller than those that cover the leaf-bud.



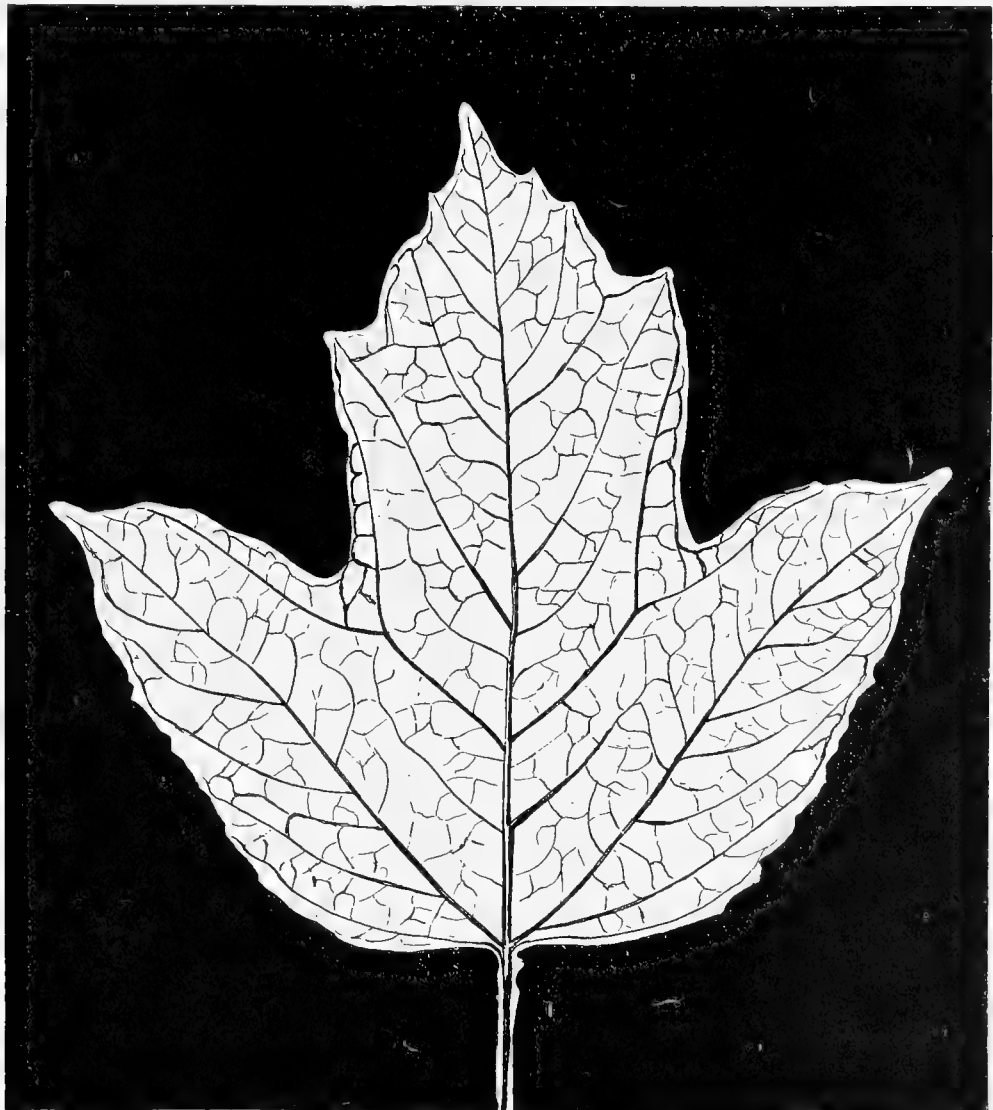
Notice the decorative
forms in flower buds,
also the separation
of the petiole with shoot

THE DECORATIVE FORMS OF LEAF-STALK (PETIOLE)
AND OPENING FLOWER BUDS.

THE LEAF AND PETIOLE.

In its earliest stage the soft young shoot is six-sided in shape, but it soon becomes round, and changes in colour from pale green to grey-brown.

The drawings show the two distinct forms which the leaves may take on the same tree. Those on the upper part of the branch are as much as four or five inches across, oblong and flat, and divided into



PLAN OF TYPICAL LEAF.

three angular pointed lobes with partially serrated edges. The lower leaves are only two or three inches wide, rounder, more serrated, and crinkled. Their tint in summer is a dull green, and in autumn reddish-purple; the upper surface darker and smoother than the under, which is covered with tiny hairs only perceptible to the touch. The main ribs show clearly as a projection on the under-side, but are indicated only by a very slight depression on the upper surface. Leaves with five lobes are sometimes found, though three is the more usual number.

The construction of the leaf-stalk, which is smooth and tinted with red, is peculiar. The upper side is concave, while, from the raised edges, grow stipules of a form not found in any other forest tree. Beyond these stipules, and nearer the leaf blade, are honey-glands. The upper end of the leaf-stalk broadens out until it merges into the base of the leaf. The exact form of the stipule and leaf-stalk is shown by the drawing.



PLAN OF THE
LESSER LEAVES.



THE FLOWER IN JUNE.



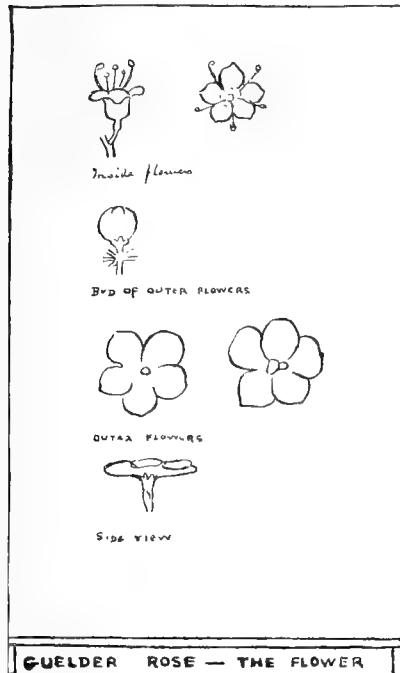
BRANCH WITH FOLIAGE AND FRUIT.



TWIGS WITH FRUIT IN SUMMER.

THE FLOWER AND BERRIES.

The Guelder Rose flowers in June and July. The blossom forms a flat umbel of florets, of which the outer are the earliest to expand.



The outer flowers are usually much larger.
The inner ones are life-size.

These outer florets are about three-quarters-of-an-inch across, pure white, and tilted slightly away from the centre of the cluster. This circle of barren blossoms encloses a mass of smaller fertile ones of a creamy-white colour. The latter have five petals united, starting above the ovary, and have both stamens and pistil; from the latter the berries are produced. The tendency of neuter or barren flowers (having neither pistil nor stamens) is to become larger in process of time, and this tendency, accentuated by artificial means, has resulted in the cultivated species of Guelder Rose, which bears "snowballs" of barren flowers

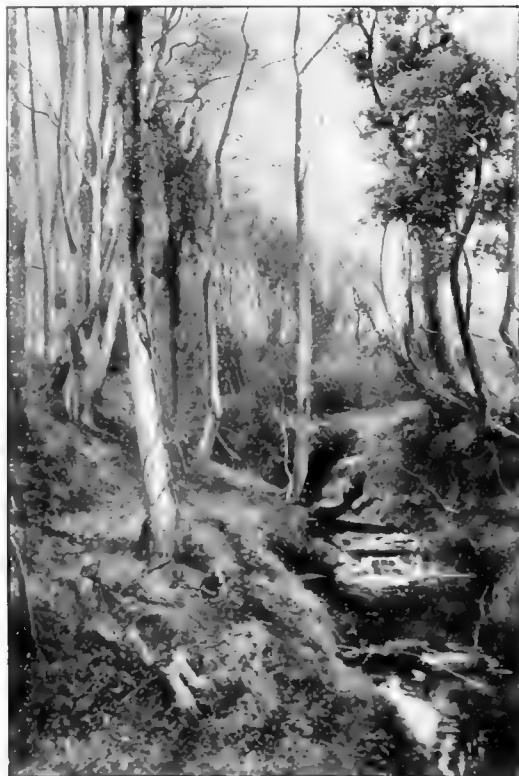
only. It is devoid of the interest attaching to the wild species, and far less beautiful.

The berries are oval in shape, each one supported by a short stalk springing from a cluster of larger stalks which radiate from a common centre. The main stalk is bent by the weight of the berries, though far less so than in the case of the Elder-berry.

Before the berries ripen they are tinted yellow on the side exposed to the light. In September they resemble white-heart cherries in colour and texture, and are full of juice. They turn at last to a bright scarlet and ruby, and remain on the trees during the winter, gradually becoming pulpy and more transparent.

THE GUELDER ROSE (*Viburnum Opulus*).

The Guelder Rose, Spindle Tree, and Cornel seem to provide the wood for skewers. Their chief use is probably, however, as cover for game, and thus many a dingle and waste strip bordering profitable land is made delightful by their blossom and fruit.



IN THE DINGLE.
EX. ROYAL ACADEMY, 1890.





THE OLD
ALDER TREE.

THE ALDER.

GENERAL REMARKS.



NOT the least pleasant of our associations with trees of different kinds, are the associations of sound. The hum of bees about the lime branches, "murmurous haunt of flies on summer's eves," the patter of the aspen leaf, which the faintest airs will set astir, the rush of ash foliage before a sudden storm, the plaint of a fir-grove which is harp of all the winds, each of these do their part in giving an irresistible speech and language to the trees of the wood. And with the Alder, for its choice of the margins of streams, we associate the sound of waters, the swirl and swish of some hasty North country beck, or the calmer ripple of a lowland brook. There, ugly, dingy, weather-beaten, but always holding its own in the marshy soil, it has for company those flowers that most frequent a lush meadow-land—king-cups, ragged-robin, and forget-me-nots.

The Alder displays a maze of roots above ground, and from them rises its knobby and swollen bole. The colour of the bark is a sombre, purplish-gray, but where the cattle rub the surface smooth, rich red-brown patches enliven it. The stem is partially hidden by upright suckers, bearing at intervals large rough leaves; their shape suggests most nearly that of a tennis racquet, for the narrower end is next the stalk, a very unusual arrangement. At a certain distance upwards from the base of the straight stem, horizontal boughs are noticeable, which curve upwards and downwards in an odd fashion. Towards their extremities are found smaller dark-coloured branches similarly curved, and forming in their turn angles with the lighter-coloured twigs.

These twigs are tufted with clusters of catkins and dark woody cones. The general lines of the tree are peculiarly unsymmetrical and harsh, for in addition to the angular habit already described, the brittleness of the boughs causes the loss of many, while from others again spring upright adventitious shoots. The stalks of the flowers, however, contribute very decorative curves, and in the spring-time the rounded shapes of the dark fruit-bearing cones contrast well with the dull red and yellow of the slender male catkins. And the twisted purple leaf-buds, growing on long foot-stalks, are not without beauty.





THE LEAVES AND THEIR DEVELOPMENT.

The buds, though only half-an-inch long, have a rather special interest. In winter their slightly curved form enables them to lie close to the twig, covered by purplish scales. But before spring comes, the pedicel begins to grow rapidly, and the bud, leaving the protecting twig, turns to the light. Soon the pedicels outstrip the buds in length, and this, together with their curious three-sided and twisted form and their arrangement in three rows, with alternating spaces, along the stem, makes them somewhat conspicuous objects. As the buds swell, the scales drop off, or simply become loosened at the base, and remain like little caps upon the tips; the inner stipules are exposed and lend to the bud their tints of brown and green. The young leaves, with their pedicels, in their opening stages suggest a hand half unclosed.



PLAN OF LEAF.

Their development is explained by the drawings. When fully grown the leaves measure about three inches in length, and they remain on the bough when autumn has robbed most other trees of their foliage. In spring their colour is of the palest green; but it soon becomes dull and heavy in tone. The reflecting power of the glaucous surface in a measure, however, compensates for this, while the leaf is gummy enough to prove a death-trap for numerous small insects. From an early stage the veins are clearly marked, and the lateral ones are so stout and rigid as to cause the leaf-blade between them to pucker.

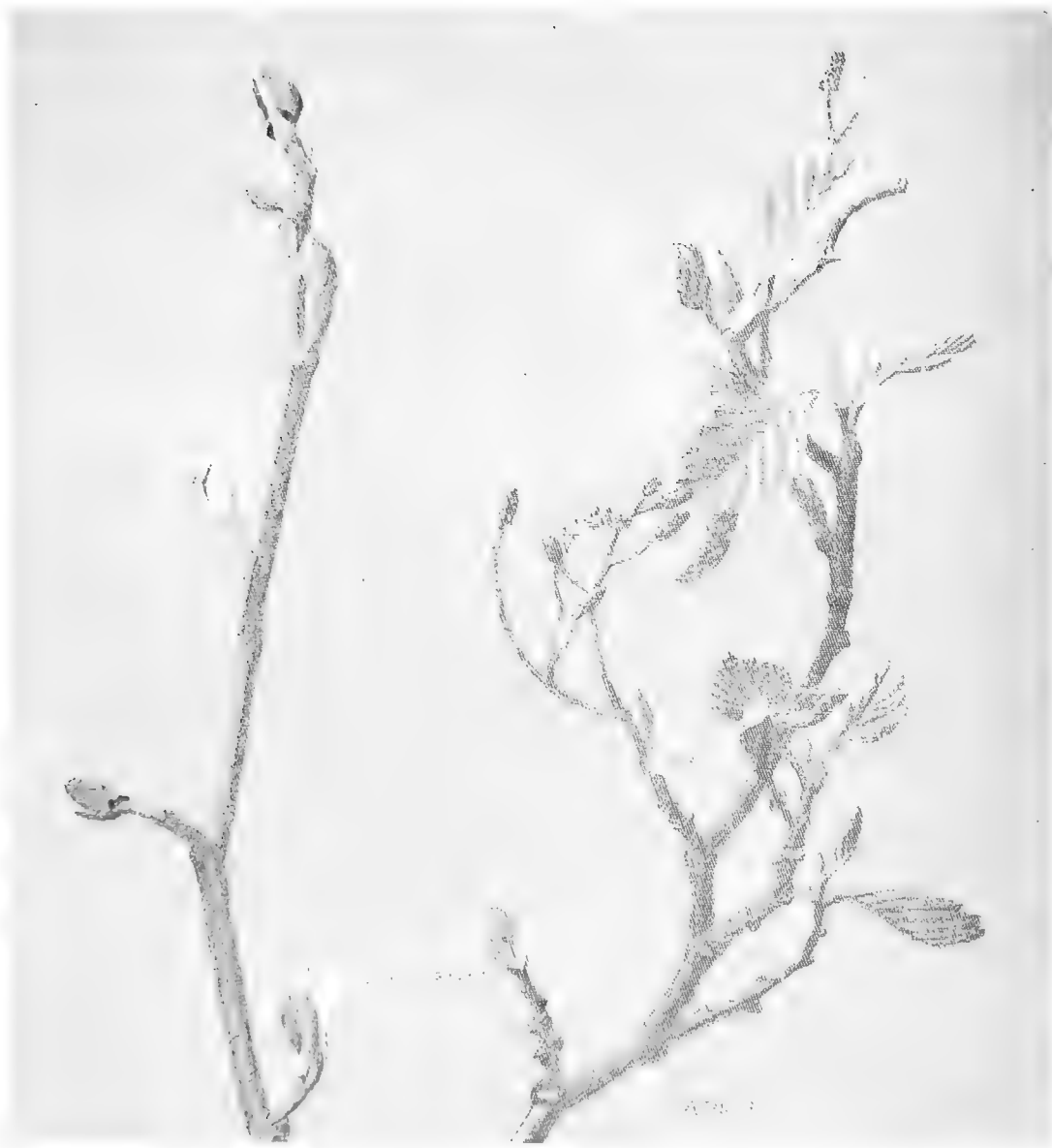


TWIG IN SPRING BEARING CATKINS AND CONES.

THE FLOWER AND SEED.

Male and female flowers are produced on the same twig. The stalk common to both springs from just below a terminal bud. It presently divides and forms two slighter curved stalks, one supporting a group of female flowers, each on its own short stalk, the other bearing the catkins arranged in pairs, also on independent but longer stalks.

The staminate catkins are formed during one summer, and remain dormant through the autumn and winter to the following spring. They then expand and become from two to two-and-a-half inches long. At first they are of a dull crimson colour, produced by the massed tips of the closely packed stamens. As these gradually separate their pollen makes a show of bright yellow, lasting until it is fully ripe. It then falls, and leaves the empty cases shrivelled, brown, and little noticeable. The florets themselves grow out on short foot-stalks in alternate pairs from the main central stalk of each catkin. These supports are of so pale a yellow that when expanded they give a curious effect almost of transparency to the catkins. The male catkins on a twig vary from four to six, the smaller number being most usual. In the spring the female flowers are merely little pointed cylinders, hardly a quarter of an inch long. Later on their vivid green colour, and still more the rough edges of the scales supporting the fruits, make them noticeable, but it is not until these scales have opened to allow the fruits to escape, and themselves have become black and woody, that they give character to the tree. The oval fruit-cones are half-an-inch in length, and remain in large quantities on the trees during the winter and the ensuing spring, showing like black dots on the bare twigs.



THE YOUNG LEAVES
IN TWO STAGES OF GROWTH

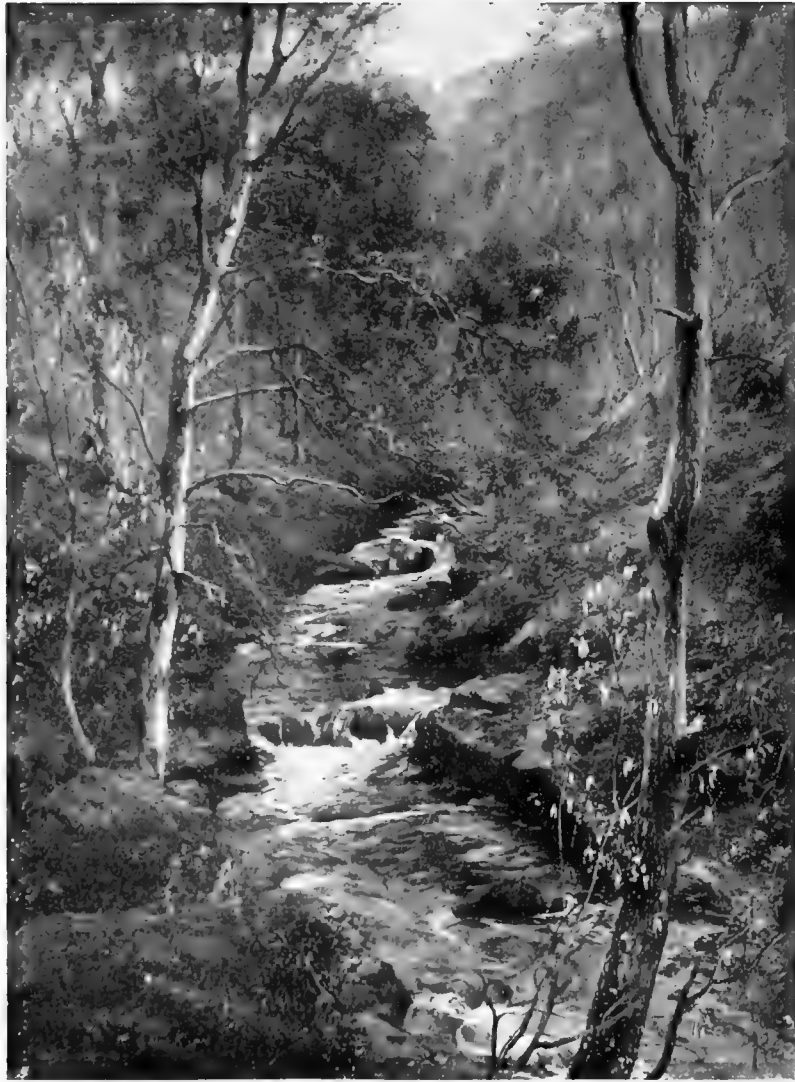
Notice the length of the leaf-pedicel, and the curved
lines of the buds.



THE LEAVES AND YOUNG CONES, LATER.

THE ALDER (*Alnus Glutinosa*).

The Alder rises to a height of about fifty feet. Damp soil and moist atmosphere are essential to its well-being. It appears to be indigenous to Japan and Siberia, and to grow freely on low land throughout Europe. It is used extensively as coppice, and can be grown in swamps where no other tree could exist.



THE HAZEL.

GENERAL REMARKS.

The spell of winter falls lightly on the copse-wood. Long after nutting-time the stout pliant Hazel-rods still carry golden leaves, nor does even the fall of these make the shoot bare, for stiff young catkins jut out from the sprays. On the ground the green and purple leaves on straggling blackberry trailers, among the hillocks of coarse grass, show in cheerful contrast to the brown and shrivelled

leaves heaped around them. Honey-suckles and elder-bushes bear little tufts of grey-green leaves. Patches of moss, with here and there a fern nestling, cushion some old pollard stump, and on the guelder-rose there are still juicy red berries.

Nor are the sounds of animal life wanting: the blue-cap prepares to build while snow is still lying on the open ground. Before spring has well come tiny flowers, like rubies, gem the Hazel-switches, and yellow "lamb's-tails" hang out their bravoury. The first anemone and the first primrose come with the earliest blackbird's nest. The bird-cherry now puts on garlands of brightest green, and spring, and the flowers and bird-songs may be counted well begun. Still the coppice seems a place apart; in its own way a small world of wonders. The vigorous suckers of alder and sycamore or some other trees put forth huge leaves, abnormal in size and colouring, most of them tinted red or purple, the oak leaves a bright scarlet. To the full-grown coppice, before its primrose carpet has faded, comes the busy hum of labour; men, women and children stacking faggots and brushwood, splitting rods for the hooper, "renning" the larger alder poles. Its day of reckoning has dawned.





THE YOUNG CATKINS (AT CHRISTMAS).

HAZEL CATKINS.

Fertile flowers and staminate catkins are produced on the same plant. The catkins form in the autumn before the nuts are ripe, and are greenish brown in colour. They stand out stiffly from the shoot during the winter, one or more growing from a single pedicel which springs from the angle of the leaf-stalk and the twig. About February the pedicels lengthen and become pendent. The numerous florets of which the catkin is composed are closely packed into a



THE CATKINS FULLY DEVELOPED (FEBRUARY)
AND THE FERTILE FLOWER.

cylindrical mass around a pendent main axis. To this axis they are attached, with no secondary stalk, such as is found in the catkin of an alder. Each floret consists of four stamens, each split so there appear, at first sight, eight. These are attached to three scales, the inner of which are hidden by the larger outer one. Those at the base of the cylinders are the first to develop, and by the end of February the whole catkin is covered with yellow pollen; when this is shed it drops off the tree.

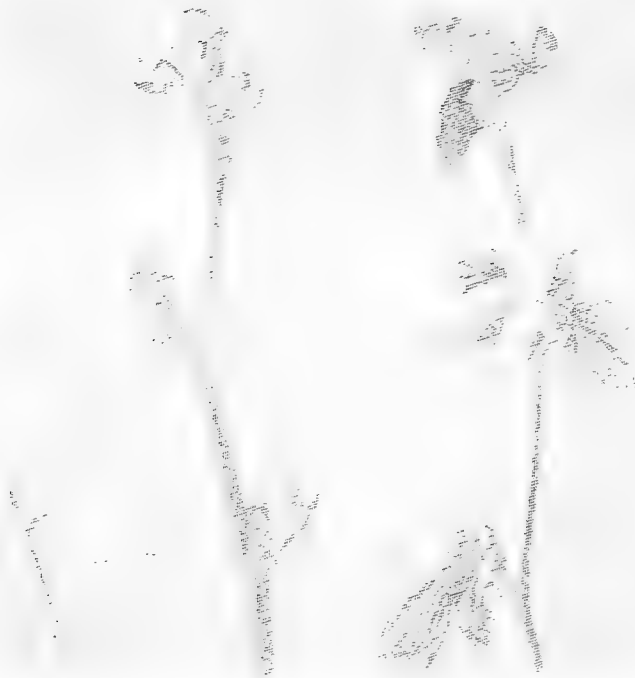
FERTILE FLOWERS AND NUTS.

Before the catkins are fully out the fertile or pistil-bearing flowers appear. The ruby-coloured or crimson threads which project beyond the apex of each flower-bud, are the stigmas only of the flower. In each bud there are from eight to sixteen floret buds, only a few of which, however, mature. Each pair of flowers is protected by a scale which hides all but the stigmas, and besides this each individual flower is surrounded by a cup-shaped bract. The thread-like stigmas of the pistil soon shrivel up, the bud-scales open out, and during the summer the nut is formed.

In August the nuts, in clusters of two or three together, lie hidden under the level leaves; their bases radiate round the apex of a pendent shoot, each nut diverging slightly from its neighbour, and all lying in a nearly horizontal position. At this time they are about half-an-inch long, of a whitish-green colour, velvety in texture and oval in outline, with the sides slightly flattened. Each one is surrounded at the base by a leaf-like frill, equal in depth to half the length of the nut. This frill or "capule" is pale-green in hue, hairy and deeply serrated, and has been developed from the cup-shaped bract surrounding the flower. Sometimes between the bases of the nuts are other smaller frills of undeveloped nuts. When ripe the shell of the nut becomes brown and smooth.

THE LEAF AND TWIGS.

The catkins have died away, and the crimson tips of the fertile flowers become shrivelled before the leaves appear. About April the round leaf-buds are covered with pink and brown imbricated scales which overlap one another. The outer row of these presently spread



HOW THE LEAVES EXPAND FROM THE BUDS.

out and form a circle of tiny cups round the green stipules which form the inner covering of the bud. As the buds develop both they and the shoot and young leaves which they produce turn downwards. The young shoot is reddish-green and hairy, and bears at its apex a cluster of young leaves pointing downwards and lying close against it. The leaves have their blades folded together at the central rib, and are almost hidden by the stipules whose growth has kept pace with their own. As the leaves develop further they flatten out, and lie like a pair of wings on either side of the lengthening shoot, which is now tipped by a new coronal of leaves arranged in similar fashion to the first. The leaves have no sooner expanded even partially than

they show certain characteristics which they maintain throughout their growth. The leaf-blade appears fluted by the secondary ribs and drawn into puckers by the tertiary ribs.

At this stage it is a dull yellowish-green without any gloss. The stipules become a brighter green and remain at the base of the stalk which supports the expanded leaves. When fully grown the leaves are from two-and-a-half to three inches long, hairy, with a wavy indented outline, and, as has been said, the blades puckered and fluted. The colour is now a dark bluish-green on the upper side, on the under side a paler green with noticeable yellowish ribs. The leaves, and the shoot and stalks which bear them, all lie flat and in the same plane with one another. This position is often maintained on the upright twigs as well as on the horizontal and the pendent ones, so that twig and leaves are in one vertical plane, and sunlight passing through them lends their green great brilliancy. Often, however, the leaves attached to a vertical twig lie horizontally, their petioles being set at half a right angle to it. The leaf-petioles are sometimes curved towards the twig, hence the larger leaves overlap it, although the twig itself does not form a straight line, but, like that of a Beech, diverges slightly from the point at which it has borne a leaf towards the next point of leaf production; the zig-zag thus arrived at is, however, less marked than in the case of a Beech. Generally speaking the arrangement of the leafage is in two rows down the shoot—the leaves in one row alternating with those in the other row on the other side of the shoot, but it is noteworthy that on upright suckers the leaves are often arranged in three rows. The newest shoots are hairy and reddish-green in colour, later on they change to a yellowish-brown, with green markings where the outer skin has become frayed. The older switches are



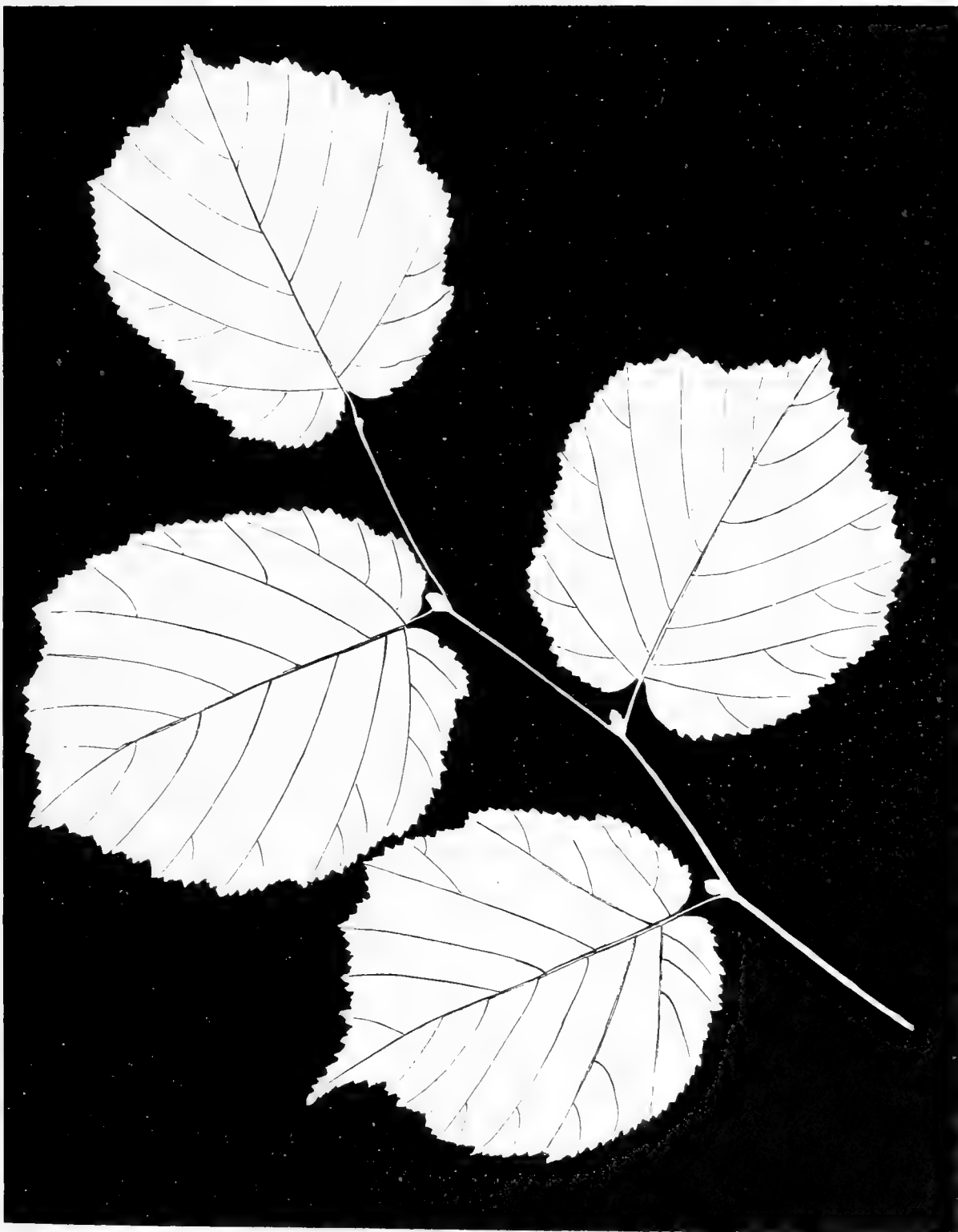
AN OLD HAZEL.



Aus. 3.

5

HAZEL NUTS.



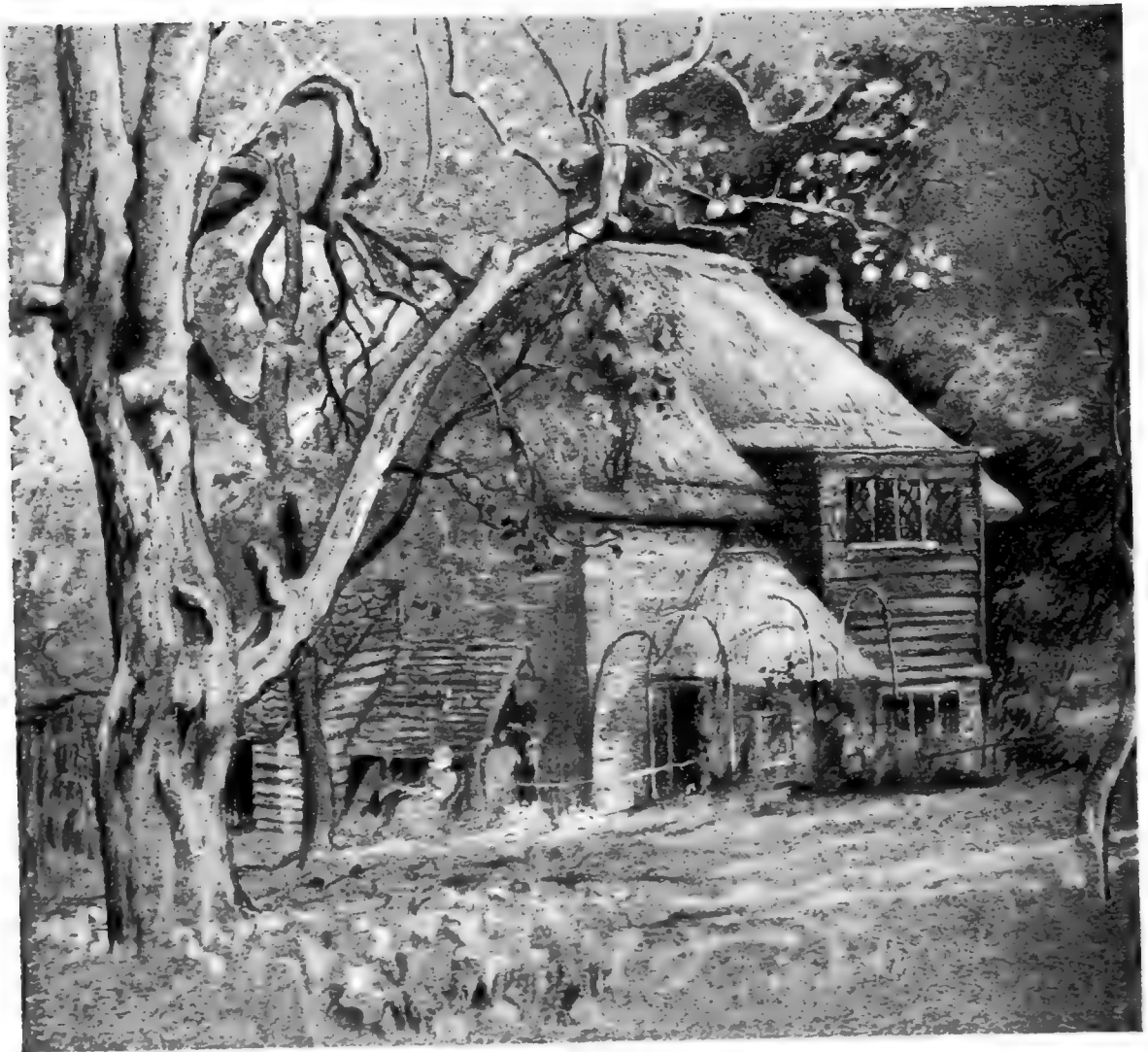
PLAN OF THE LEAVES.

shining red or purplish-brown, the oldest stems become grey and silvery and often covered with lichens.

THE HAZEL (*Corylus avellana*).

The Filbert and Cob are varieties of the Hazel. The nut of the Filbert is hidden by the cupule—the leafy frill that envelopes and projects beyond it. The cob nut is larger and rounder than the Hazel, and has not the long “beard” of the Filbert. The Hazel produces good withies for barrels, pea rods, walking sticks, staves for hurdles, and all purposes for which rods of a pliant and strong quality are required.





THE LABOURER'S HOME.



WHARFEDALE PASTURES.

(EX: ROYAL ACADEMY, 1899.)

By permission of A. Chignell, Esq., the owner of the picture.

THE APPLE TREE.

GENERAL REMARKS.



HE charm of the Apple Orchard is the homely charm of an everyday familiar scene, and yet a charm not without complexity. There is first the beauty of well-poised stems (notice as you pass how the undulation of the ground robs them of their graceful proportions when they are reproduced in a pantomime of shadows on the grasses underfoot). There is the delicate pink-and-white beauty of the blossom in early summer, and the richly coloured fruit crop of autumn. But close by the orchard stands the labourer's thatched cottage, with its oddly shaped hen-coop and well-worn "grin'stone." So the beauties which nature lends the scene are inseparable from the suggestion of human care and forethought, which is found in such details as the lime-washed tree stems, or, still more strikingly when the highly cultivated type is compared with the crab-apple in its wild state.

RAMIFICATION.

It is clear that the branch-system of a tree cultivated for the sake of its fruit must differ materially from that of the wild stock.

The deliberate use of the pruning knife, accidental injuries to the twigs during the fruit-gathering ; the removal of dead boughs ; the



profusion of blossom encouraged by artificial nourishment ; these are all accountable for eccentricities in the arrangement of the branches. The weight of the fruit crop forces the smaller branches into a pendant position. Two other features very characteristic of the tree are to be attributed to the repeated loss of one arm of the fork in which, as a rule, the branches terminate during the earlier

stages of growth. These peculiarities are (1) the horizontal growth of the upper boughs, which gives the tree its topped outline, (2) the abrupt angle at which the branches diverge, in a curious zig-zag fashion that often produces a corkscrew twist. Where the forks remain intact they mark a stage in the gradation from bough to branch and from branch to twig, so that the diminution may be followed step by step. But where the fork becomes mutilated, there is the effect of an abrupt change, instead of a gradual transition, from greater to less. These twists and unexpected angles are the more conspicuous because the line of the vigorous new shoot is normally simple and upright.

Many trees, however, have trunks simply curved, and some young trees have slender branches of considerable length which are borne



APPLE TREE.



IN THE ORCHARD.

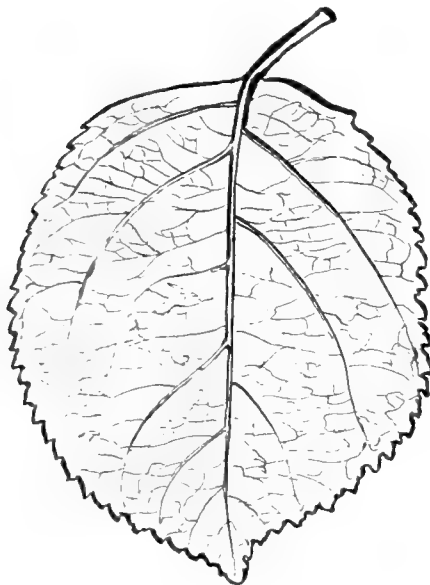


THE YOUNG LEAVES.

to the ground by their burden of fruit. Foliage and flowers are for the most part produced on short, stout, knobbed twigs encircled by rings set close together and coloured a dull dark grey. The lighter grey of the trunks is varied in places by the tints of lichen or moss. The outline of the tree may be roughly represented by a hemisphere, for the branches spread laterally to a distance equal to the height of the tree.

THE LEAF.

Early in May the young foliage is conspicuous. The leaf-buds stand erect, the edges of the outer leaves folded round the inner



PLAN OF THE LEAF—NATURAL SIZE.

ones, so that only the under sides are visible, with their tints of pale green, and their coats of white down. The upper surfaces, when the leaves spread out to the light, are of a brilliant shining green, and the blade is puckered. When seen against the sky, the leaf appears semi-transparent, and the veins make a pale yellow pattern over it. At its base the leaf-stalk becomes broader and flatter, and bears a stipule like a wing on either side. As summer comes

on, the upper side of the leaf turns to a rich dark green, its surface is smooth, somewhat shining, and indented by numerous veins. The under side is coloured a pale fresh green, and thickly coated with brownish white wool. The main and secondary veins project from the under surface like chords; they also are wooly and paler in colour than the blade itself. Late autumn brings tints of yellow to the foliage, but of a less brilliant hue than those of the plum trees. These already cover the ground, while the apple has hardly lost a leaf, and many are still green. Here and there is a leaf of crimson red, with blotches of green or bronze. This description may serve to point out some characteristics of apple leaves in general. The difference in size, texture, shape, and colouring, that distinguish the leaves of so many species may be found in books dealing with their culture.

On the shoots which are normally developed the leaves grow singly, and are arranged symmetrically in sequences of five, so that the first leaves of every sequence are to be found in the same position on the twig, one below the other. But many of the twigs are much stunted in growth, so that the leaves they bear appear like a rosette, because the spaces between the insertions of the leaf-stalks are indistinguishable.



FLOWER BUDS.

THE FLOWER.

An earlier description, that of the hawthorn, served to show how greatly the appearance of the flower-heads of similar character depend for variety on the length and number of the stamens borne by the single floret. In other types of flowers, where the stamens show less tendency to vary, the flower-clusters owe their distinctive appearance to the comparative opaqueness or transparency of the petals. The petal of the Apple-blossom is so transparent that not only the shell-pink tints of the under-side, but even the green of a leaf on which it may be resting show through the delicate whiteness of the upper surface, which has a velvety texture.

The flower-buds are cup-shaped, the petals being curved inwards and overlapping at the points and sides. The bases of the petals taper to a fine point, so that when they are fully opened there is an oval space between them towards the centre of the flower, through which the pale green sepals are visible. The sepals are bent back towards the stalk, and each one has a dull purple tip. Like the flower-stalk and the young leaf-stalks, the calyx is covered with silky hairs.

The stamens are of the palest green, scarcely distinguishable from white, and tipped with yellow of the tint of ochre. The pistil is also pale green and split into five segments (styles) nearly down to the base. Every floret has its own stalk, and the stalks are all of equal length, and grow several together in a cluster from the same point on a twig.

After the pollen from the stamens has been carried to the pistil by the bees, and the ovary at its base is thus fertilized, the petals and stamens fall off, and there remain only the sepals and the ovary, which is enclosed in and fused with the floral receptacle. The



APPLE FLOWER.





APPLE BRANCHES WITH BLOSSOM.

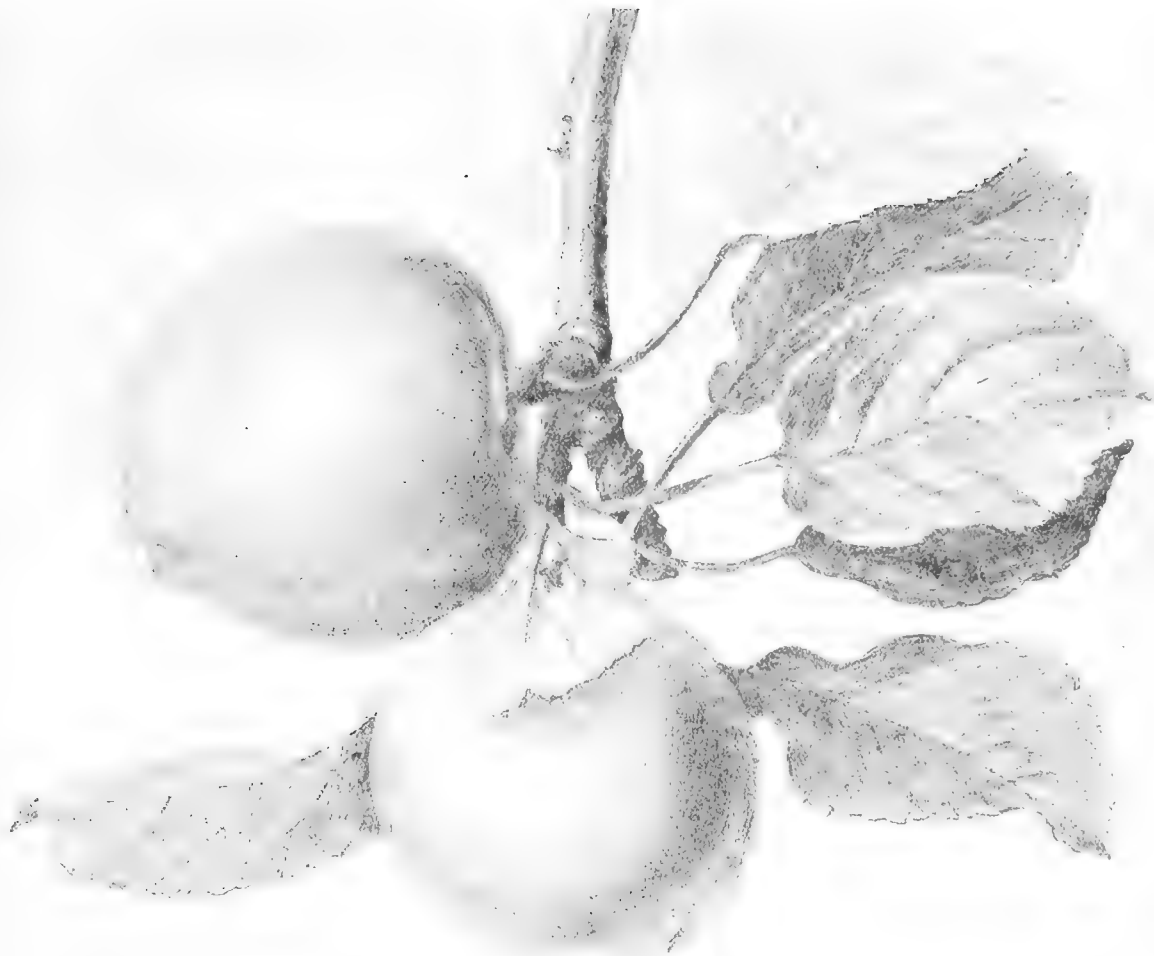


REX VISAT COLE

FRUIT LADEN BRANCHES



APPLE.



A SUSSEX CIDER APPLE.

receptacle now increases rapidly in size, and becomes fleshy ; the weight of the fruit presently causes it to become inverted. In the mature fruit the sepals are still to be seen in the eye or hollow at the top of the apple, opposite the hollow at the base into which the stalk is inserted. The inner dry part of the ovary with the five seeds make up the core.

The Apple Tree is usually in flower by the middle of May, and about September the green fruit turns to yellow, red and brown. There are numberless varieties of apples, some with polished cheeks, some with dull ; some evenly spherical in shape, others "dimpled." They vary no less in size ; but whether they are two or four inches in diameter the character of the apple is unmistakeable.



APPLE TREES IN THE HOP GARDEN.

The Apple Tree is not entirely confined to the garden and orchard, and in the early summer not a few landscapes owe their charm to the beauty of the Apple-blossom.

In many a Kentish hop-garden the monotony of the bare poles is broken by the young Apple Trees planted here and there. Sometimes they are to be found on the borders of a wheat-field, where their pink and white blends with the dazzling green of the young blade. Or again, in the sad waste that was once a cottage-garden some old gnarled tree lifts its clusters of blossom above the dock and thistle which flourish beside the ruins of the homestead.

THE APPLE TREE (*Pyrus Malus*).

Authorities tell us that the Apple Tree is a native of the British Isles; also that it grows wild in most parts of Europe, Asia Minor and Persia, and that it is cultivated in all parts of the world where it can be made to grow. Some 1,500 varieties of the tree are catalogued, and its culture has reached a climax in the production in Colorado of a variety destitute of core or seeds. The varieties bear fruits specially adapted for the table or for cooking, such as the Golden Pippin, the Ribston Pippin, the Russett. Others are grown for cider, such as the Cherry Norman, Foxwhelp, Kingston Black, Broad-leaved Norman.



THE CRAB TREE.



BRANCH OF CRAB APPLE.

THE CRAB APPLE.

GENERAL REMARKS.



THE Crab Apple is worthy of study and of comparison with the apple of our orchards, for it would be hard to find a more vivid, though familiar illustration of the difference between the tree when carefully tended, and the parent stock where all the restraining influences of cultivation are absent. Here the blossom is more scanty, the fruit poorer, the leaves smaller and narrower, the growth gnarled and arrested at a thousand points. Old Crab Apples often do not exceed the dimensions of a bush, although here and there specimens are found some thirty feet in height.

THE BRANCHES.

The trunk is covered with dull, brown-grey bark, rather tough in texture—it soon ramifies into boughs, and again into numerous many-angled branches, all coloured a dull, dark grey. Both the trunk and its sub-ordinates produce wavy adventitious shoots. The branches become pendent and give off projecting shoots, which grow to a considerable length, only interrupted by stiff, stunted twigs, covered with raised rings, and bearing each a bunch of leaves round the terminal bud. The whole tree is a maze of wiry twigs in every direction, threaded by numerous large branches.

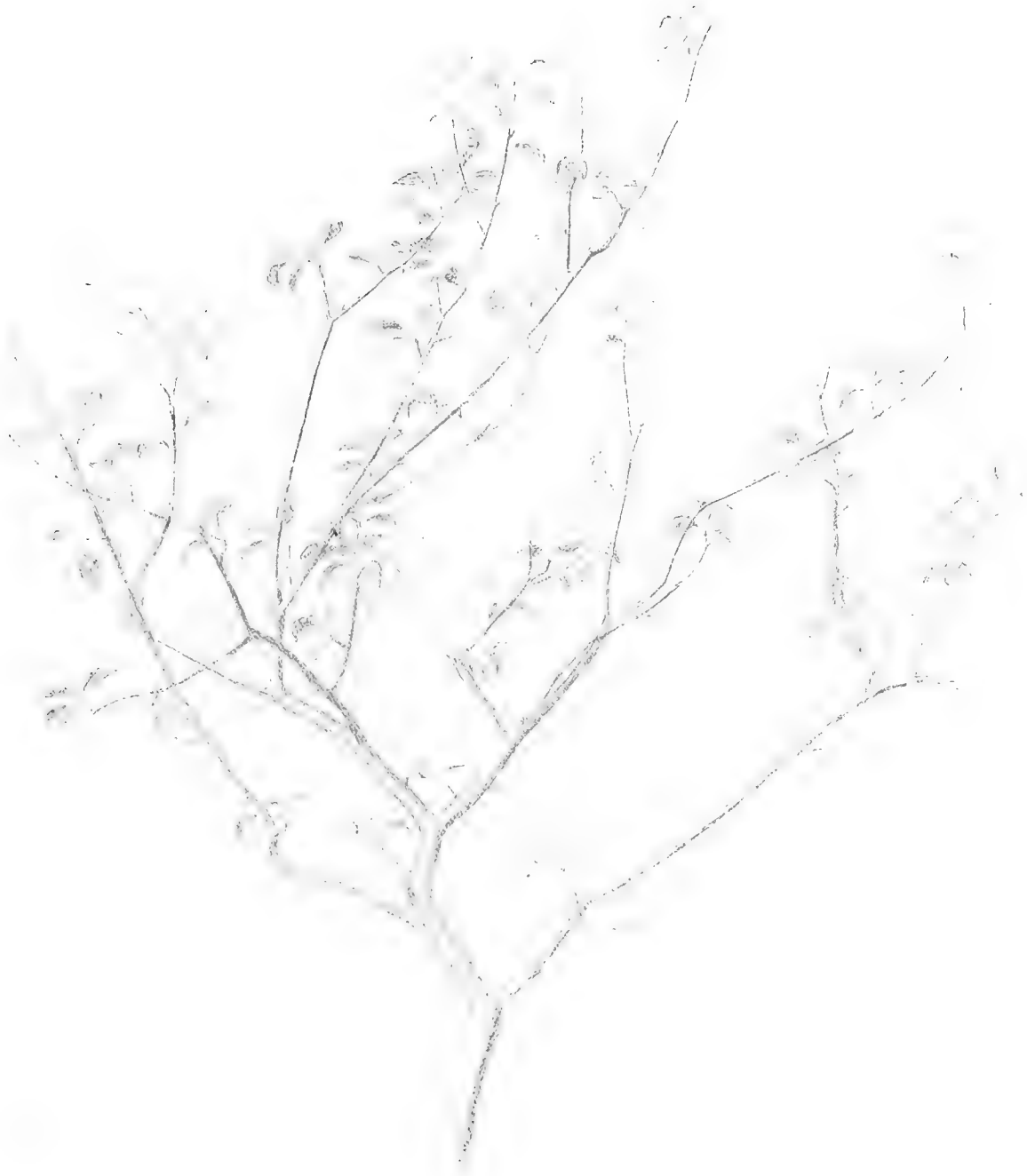
THE LEAF.

In September the shoots formed during the summer are to be distinguished by their red-brown colour. Small alternate buds, pointed



at the top and thickened at the base, are arranged down the shoot in series of five, and lie close against it. Last year's leaf-stalk has left its traces at the base of the buds in a projection running down the shoot, which destroys its roundness. This, however, is restored in the older twigs. About the end of April the young leaves are to be found standing upright, the two edges rolled inwards towards the central rib. The earliest leaves to expand form a rosette round the inner and less well-grown ones, which are still upright. The young leaves are semi-transparent, shining, and

tinted a red brown ; their stalks are covered with white hairs, which

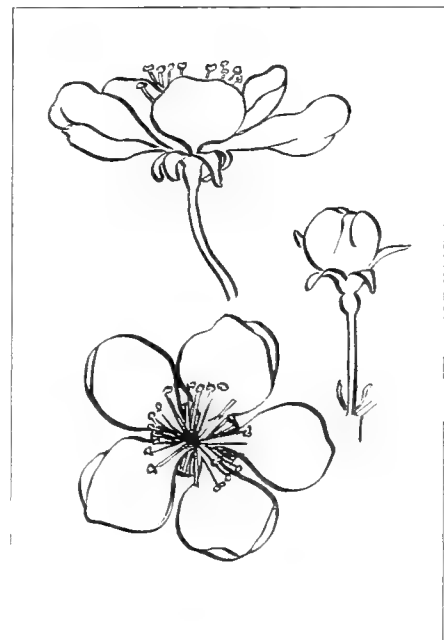


THE BRANCH ARRANGEMENT.

encroach on the base of the leaf-blade. At the base of the leaf-stalks are broad green stipules tipped like rudimentary leaves, and having serrated edges, and a pair of narrower stipules serrated in the same way. Below the stipules the dark bud-scales are still attached. Both surfaces of the perfect leaf are smooth, the upper is somewhat the darker, the under is silvery, and divided by a prominent mid-rib. The network of veins which cover the leaf-blade are conspicuous when it is seen against the sky. Some leaves are tapering, others have blunted points, in all cases the edges are serrated, and one half of the blade joins the petiole higher up than the other, making the base irregular. The puckered look which the leaves have in the cultivated tree is absent in the Crab Apple. In their mature stage the leaves become a vivid yellow-green.

FLOWERS AND FRUIT.

The flowers, though less abundant than on the orchard tree, often cluster nearer together, owing to the arrested growth of the twigs. The petals are white or white and pink, and appear less crumpled. The apples hang on longer, slighter stalks, and measure about an inch in diameter. All the stalks of a cluster spring from the same point on the shoot, and the stalks are nearly equal in length. The colour of the apples, at first a vivid green, changes to yellow and red early in September.



PLAN OF THE FLOWER.
(Natural Size).



A BRANCH OF THE CRAB TREE IN SEPTEMBER.

THE WILD (CRAB) APPLE (Pyrus Malus.)

The Crab Tree is a native of Great Britain. It rarely exceeds thirty feet in height. Dwarfed Trees bearing all the characteristics of old age, though not exceeding the dimensions of a bush, are common.



CRAB APPLE BLOSSOM.
(Natural Size).





BRANCHES WITH BLOSSOM.



A BRANCH OF CRAB APPLE.



CRAB APPLES.
(Natural Size).



OLD CRAB TREES OF THE HEDGEROW.



THE PRIVET.

GENERAL REMARKS.



IF the winter-season has nothing to show comparable for gaiety of colouring to the spring-flowers, or for richness to the fruits of the autumn hedgerow, a whole gradation of tones, delicate and unobtrusive are peculiarly its own. Silver-grey on the bark of Rowan-tree or Ash-sapling; the mealy stems of the wayfaring tree, or the yellow tints of the Elder-berry; the red and purple of Maple or Cherry or the nut-brown of the Hazel tree. Nor are all alike sombre in tone: the Cornels and the Withies have crimson shoots, the Spindle tree bright green ones; the Hollies bear a load of scarlet berries and glistening leaves. To this wintry harmony the Privet lends the soft greens of its foliage and the glossy blackness of its clustered berries.

THE PRIVET (*Ligustrum Vulgare*).

The Privet is but rarely left to grow to its full size; single trees, however, of twelve or fifteen feet in height, are occasionally met with. It can be grown in almost any soil, position, or atmosphere; and is equally indifferent to the smoke of a town or the shade and drip from trees overhead.

The Privet usually is a low bush with many upright stems. It is specially suited for garden hedges, for it will bear close clipping and frequently retains its leaves throughout the winter, in sheltered positions, although not an evergreen. In its wild state it forms a good undergrowth and will live under the shade of other trees.

Varieties with variegated or yellow leaves are extensively cultivated. The leaves of these appear to be more oval in shape, and of a less leathery texture than those of the common bush. The quality of the soil, and the weather, play an important part in determining the predominance of the green or yellow tints of the leaves.

TWIGS.

The twigs are of a light brownish grey colour, and bear from four to eight opposite pairs of shoots, each pair being set at right angles to the pair above or below it on the stem. The twigs are usually tipped by a pair of shoots forming a fork. This is due to the fact that flower-buds are produced at the extremity of the shoot and the growth of the branch has therefore to be continued from the lateral buds. In this respect the Privet differs from the Spindle-tree which bears its flower-buds near the base of the shoot. The shoots are reddish-green in colour, and at their bases are one or two pairs of pale green modified leaves, while other pairs of leaves, set on the shoot at half a right angle, indicate the places later on to be occupied by new shoots.



FLOWER OF THE PRIVET.
(Natural Size).



THE BERRIES (Natural Size.)

FLOWERS AND BERRIES.

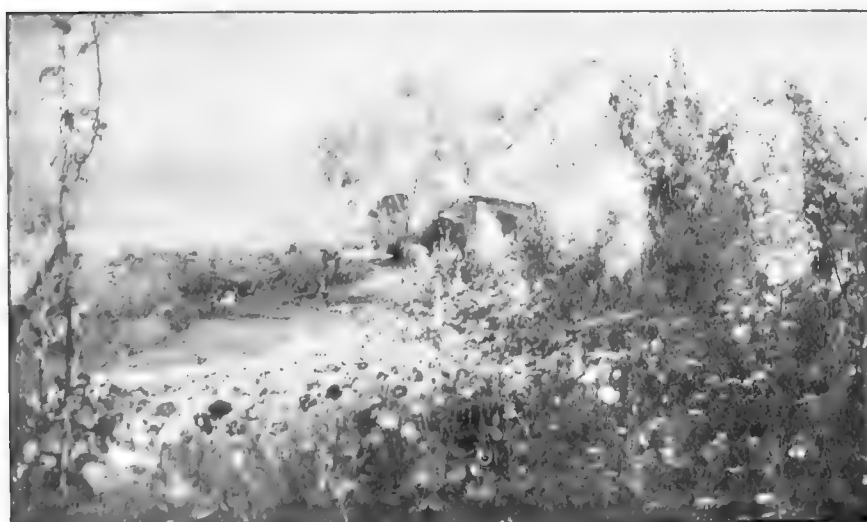
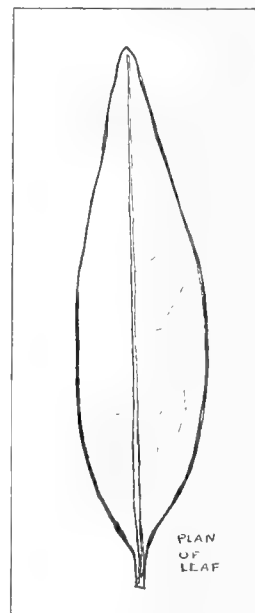
At the extremity of the shoot, and in the axils of the last, or the last two pairs of leaves the flower-buds are produced, and by the middle of May they appear as a spike of tiny greenish-white clustered buds, while the bush is in full leaf. Towards the end of June these small buds expand, and the numerous florets, which consist of four white-pointed petals, and are set on pale-green pedicels, form an upright raceme resembling a miniature flower-spray of lilac.

In August the berries though small are clearly noticeable, being club-shaped and of a bright shining green. By the autumn they have become round and black and have attained to the diameter of about

quarter of an inch ; they often remain on the bush throughout the winter.

THE LEAF.

The leaves are thick and somewhat leathery in texture ; in colour a bright green when they are young, and of a darker tint later on. The base of the leaf tapers till it meets the shoot, and it has practically no stalk. The mid-rib is prominent on the underside, but the other veins can scarcely be seen. The diagram will serve to explain the size and shape of a typical leaf, though broader ones are equally common.



INSIDE THE PRIVET HEDGE.

ONLY FLOWERS OF SUMMER TIME. EX: ROYAL ACADEMY, 1902.
Painted by C. Leard, Esq., the owner of the picture and copyright.



THE HORNBEAM.

THE HORNBEAM.

GENERAL REMARKS.



THE distinctive features of the Hornbeam must be sought for with some care, in the beautiful forms and colouring of branchlets, stipules, and catkins, otherwise we may be tempted to dismiss it summarily as but commonplace, or to apply to it no more interesting epithet than that of a "pretty" tree. The trunk is straight and often spirally fluted, sometimes it presents the appearance of a gigantic faggot of stems, inseparably bound together, crossed, and interwoven by flat sinews of smooth bark; the bark itself of so pale a grey that it is sometimes all but white. The boughs take an upward direction, and ramify with much regularity. They are slender and round, and subdivide rapidly into branches with pendent ends bearing a large number of delicate twigs. On the lower branches these twigs grow in flat layers not unlike those on a beech-tree: the habit of the upper branches bears some resemblance to the Wych Elm, and where two come into contact they very often unite. The outline of the Hornbeam when in leaf lacks the straight lines that give character to most trees. It is the shape which Ruskin aptly calls "an inverted pear with the stalk downwards."

THE FLOWER AND SEED.

Male and female flowers are found upon the same tree. The males appear before the leaf-blades open and grow singly from points

on alternate sides of the twig. About April they are found as cylindrical catkins, from 1 to $1\frac{1}{2}$ inches long, hanging from the tree. Each of the clusters of stamens which compose them is covered, and completely hidden, by a sharply pointed triangular cap. These caps are of a pale yellowish-green with a curiously metallic surface and a tinge of red at the tip. When at the end of April the catkins reach their full length (about two inches), the little caps spread out and display the red stamens, which soon turn yellow and give a softer look to the whole catkin.



YOUNG LEAVES AND MALE CATKINS.



MALE CATKINS (Natural Size).



BRANCH IN EARLY SPRING, WITH MALE CATKINS.



THE FEMALE CATKIN AND YOUNG LEAVES.

By this time the leaves have begun to develop and the female catkins have appeared. They are smaller than the male flowers, and are less densely covered by the slender green pointed caps, between which the stigmas show like threads of crimson. At the base of the female florets are green scales like the leaf-stipules in form.

By June these catkins have grown to about four inches in length, and their unusual form and papery texture make them very conspicuous objects. At this stage the green caps or sheaths are sometimes as much as two inches long and roughly triangular in shape. Each is made up of pointed lobes; the central one which is the longest, diminishes in width towards the tip by regular steps. The sheaths are placed opposite to one another so that they form a sort of inverted bell, at the base of which is an angular nut. Down the

centre of each lobe runs a strong rib, giving off at right angles branch-ribs which pucker the sheath between them. The nuts, each one with its two enfolding sheaths, are supported on short pedicels and arranged in pairs. These pedicels are connected with others, given off at intervals along the main pendent pedicel of the catkin.

The female catkins remain on the tree till autumn, when the seed is ripe. All through the summer, by their size and their vivid green, they give to the boughs the appearance of being densely covered with foliage, while the male catkins do their part earlier in the year by lending colour to the bare branches.



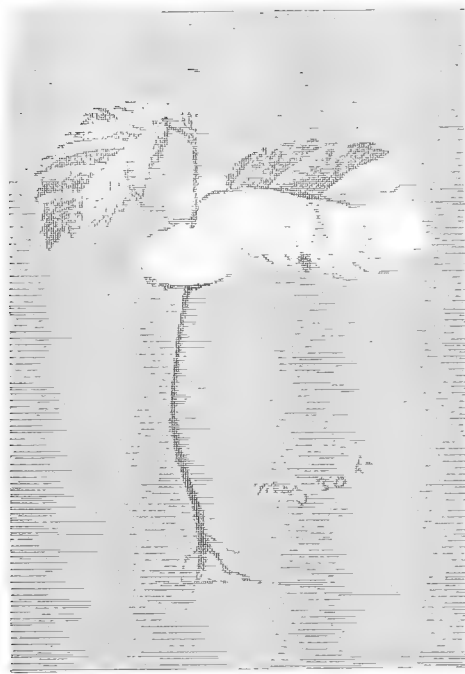
THE LEAFY WINGS OF THE CATKIN WITH FRUIT.

THE SEEDLING.

The Seedling of the Hornbeam is a striking example of the dissimilarity which so often exists between the seed-leaves of a tree and the true leaves which are afterwards produced. In this case the seed leaves have a disc-like form, a flat surface, a straight uncut edge; while the blades of the true leaves are fluted and their outlines are notched. In making the comparison many points must be taken into consideration. For example, some cotyledons (seed-leaves) have no



FEMALE CATKINS FULLY GROWN (Natural Size).



SEEDLING OF HORNBEAM.

footstalks, while the true leaves possess long ones; or again the cotyledons may be arranged in a pair, the one opposite the other on either side of the stem, while their successors show no such arrangement, and spring from different points on the stem. Seed-leaves also differ from the true in colour, in texture and in size. Sometimes the transition from the pattern of the cotyledon to that of the leaf is a gradual process, and the leaves that immediately follow the cotyledon rarely show the type in its completion. Often there are many stages to be passed through, and the disguise in each is scarcely less complete than it was in the case of the first seed-leaves. But little by little the type emerges, as each leaf, or pair of leaves, follows in the procession of development, until perfection is attained. Even in individual seedlings from trees of the same species there is variety in the stages of transition.

Some of the more striking differences between seedlings are:

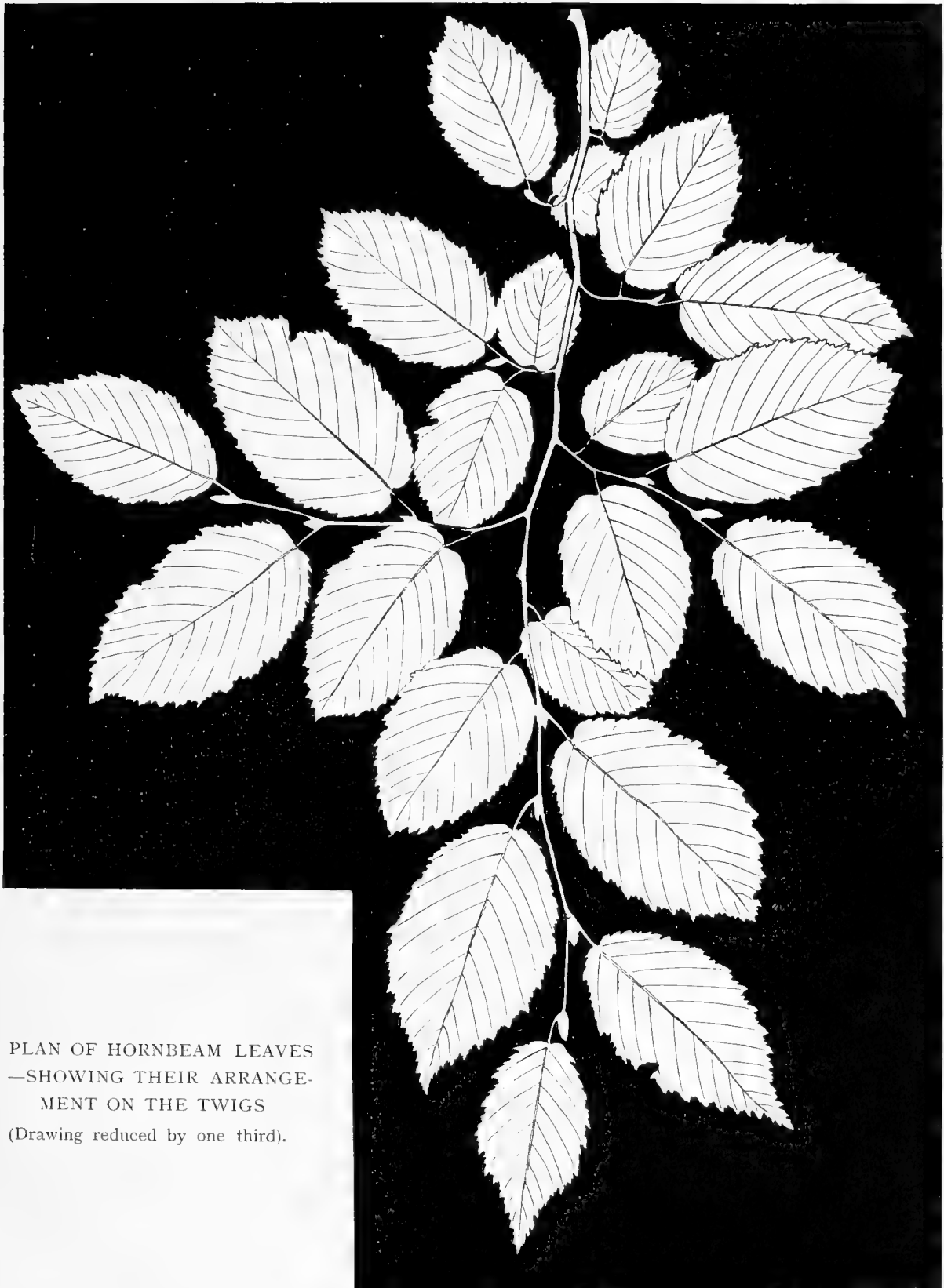
described elsewhere in this book, while those who are interested in the subject will find in Lubbock's study "On Seedlings," the results of much close and loving observation.

THE LEAF.

The buds grow alternately on the twig and lie close against it, they are long, broad and pointed. About the second week in April a touch of pale green appears at their tips; this is the back of the first young leaf. It is folded lengthways along its secondary veins, and these are covered with silvery hairs, which protect the tender bright-green leaf-blades.

Each leaf as it emerges finds further protection in a pair of long pale-green stipules with pointed tips of pink. The leaves expand and flatten out like those of a beech, from which they are chiefly differentiated by a rough unpolished surface and notched edges, while their bases are somewhat broader and have more tapering points.

The spring-tint of the foliage is a fresh yellow green, which Summer dulls, and Autumn changes to yellow and then to gold. All through the winter the leaves, now withered to a dull rusty brown, cling to the branches, a habit of growth which the Hornbeam shares with the Beech, and which makes it of equal value as a sheltering hedge in the garden. In the distribution of the leaves and twigs the problems of plant-economy are solved in a marvellous way; for all the available space is occupied, yet there is little overlapping, so that every leaf can gather its due supply of light and air, and the moisture which it contributes to the nourishment of the whole. This arrangement is shown in the following plan of the leaves and twigs.



PLAN OF HORNBEAM LEAVES
—SHOWING THEIR ARRANGE-
MENT ON THE TWIGS
(Drawing reduced by one third).



OPENING LEAF BUDS.



THE LEAVES FULLY EXPANDED
(Under Life Size).



TRUNK OF HORNBEAM
(Notice the fusing of the two branches).



“BIRD’S NEST”—A DEFORMITY OF THE TWIGS

DEFORMITY OF THE TWIGS.

Among the twigs of the Hornbeam, as amongst those of the Beech, "birds'-nest" excrescences are often to be found. These disfigurements are due either to the puncture of a shoot by insects or to some defect in the nourishment drawn from the soil. The branchlets, instead of developing normally, end abruptly in a swollen knob, which bears tufts of twisted and contorted twigs. Often one or two twigs of the normal type issue from this ungainly mass, and seem to call attention to its shapeless deformity by their own slenderness and the precise arrangement of their buds.

Some description of the way in which trees are affected by insect life is given in the notes dealing with the Hawthorn.

THE HORNBEAM (*Carpinus Betulus*).

The tree appears to have been introduced into England at the end of the 15th century. It grows to a height of 50 or 60 feet, and can live in a cold clay soil, and on exposed hill-sides. The young trees are used for hedgerows, for they bear clipping well, and retain their foliage throughout the winter; a characteristic which also makes them useful as underwood for game cover. The Hornbeam is a valuable coppice tree, and gives good fuel. The wood is used by wheelwrights—it is exceedingly tough, but not elastic. Hornbeams are common throughout England, and fine pollard specimens may be seen in Epping Forest.



LARCH TREES.

"YOUNGSTREE WOODS." EN: ROYAL ACADEMY, 1899

THE LARCH.

GENERAL REMARKS.



JUST as the oak, with its powers of stubborn resistance to the elements, may be taken as an emblem of the strength of inflexible will, so the larch typifies strength of another kind, the strength of perfect adaptability. Its long, flexible boughs bend before the onslaught of the winds; but, unimpeded by any heavy mass of foliage, they are not broken. Its slender, undivided stem sways from side to side, but bound to the earth as it is by numberless small rootlets, spreading themselves even beyond the radius of the branches, it stands in the most exposed positions with far more assurance of safety than sturdier trees, in places, indeed, quite untenable by any other species.

The Larch is a good example of regular growth in a tree. The round and tapering stem rises from the ground in a single vertical line; from it, at short intervals, radiate tiers of branches, the lower ones pendent, the higher ones inclined upward. From base to summit these tiers are graduated in size, and diminish with perfect regularity. From the boughs droop the flexible branches which support a fringe of hanging twigs. These twigs are tufted with upright cones and branches of soft, fresh green leaves. The tree has thus a conical outline, filled in with a tracery of most dainty and intricate design.

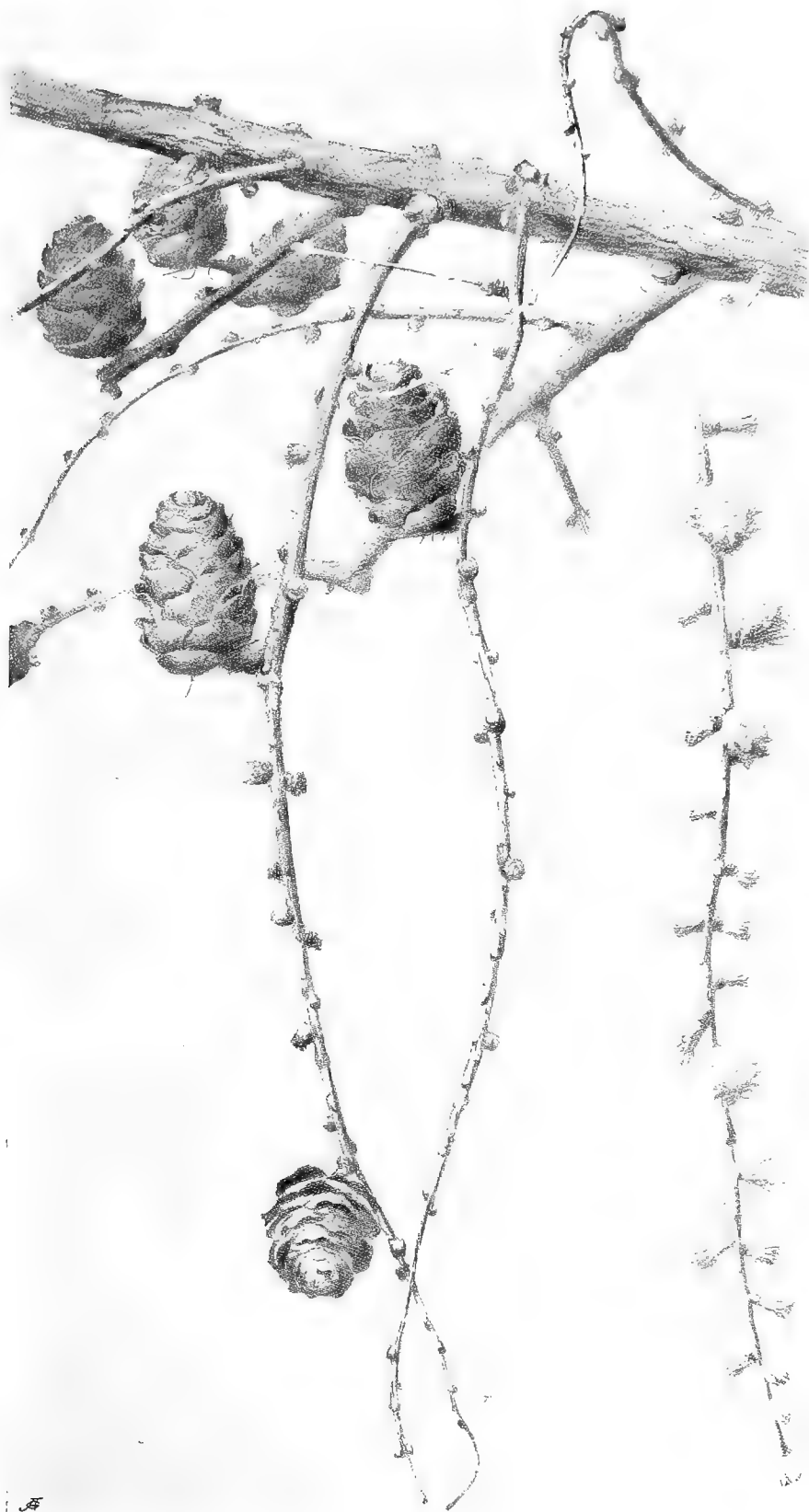
Go into a Larch wood on a day of early spring if you would see it at its most magical moment. The more distant trees, seen perhaps against a background of soft gray sky, seem veiled in a haze of

gold, which is the first token of the budding twigs; upon those nearer at hand you can learn the detail of this drapery of green and yellow, or perceive the waxen flowers, glowing in pink and crimson, while the purple-tinted boughs of Alders or Birches hard by are still bare. There is no such stillness as the silence in a wood of Larches. No bird-songs, no stirring in the springy bed of narrow needle-like leaves on which you tread: the eye undistracted follows the long vista of parallel stems, far and farther, into a mazy distance, with perhaps at the verge a point of sky very faintly seen.

In the general structure of its wood, root, flowers and cones, the Larch closely resembles other members of the conifer tribe, while stem, bark and ramification, though they show some points of difference, unmistakeably proclaim the family to which it belongs. In some few characteristics, few but important, the tree stands by itself. The leaves are soft in texture and fall at the close of the season, while those of the Pines are stiff and remain on the tree for several years. On the Pines and Firs, which are evergreen, the old dark foliage becomes more or less glaucous as the seasons pass, while a few young leaves of a paler green grouped here and there are the only traces of renewal. On the other hand, the bare winter boughs of the Larch are clothed afresh each year with the bright green garment of spring, and later with the dull-green and gold of the advancing years.

THE TRUNK AND BRANCHES.

The trunk is upright, undivided, and small in diameter considering its height, which, in a fully-grown tree, reaches eighty or ninety feet. The trunk appears to taper more gradually than in other deciduous trees, where the stages of growth may generally be traced



BRANCH WITH CONES
IN WINTER.

THE YOUNG CONES AND
LEAVES IN SPRING.

like the sections of a telescope. This appearance results from the unusually short intervals between the numerous tiers of branches (whether they still remain, or whether their former presence is indicated only by a scar). The difference in girth above and below each tier is practically indistinguishable, and the outline of the trunk appears to be made up of two straight lines converging towards the summit. The branches are short and slight in proportion to the height of the tree. They grow from the trunk in horizontal whorls, and so form right angles with it. They appear to be inserted into the stem rather than to grow from it, and are surrounded by a necklace of bark. With age the lower ones become drooping, and the upper ones more upright. The smaller branches again, grow at first horizontally from the boughs, but quickly become pendent, while the slender branchlets which they support are borne down by the weight of the cones. The growth of the tree is continued from buds at the tips of the shoots. The lateral buds produce, for the most part, flowers and leaves tufted on arrested branches. Trees grown in a confined space, or even single specimens when old, lose all but their upper boughs, and since none of the Pines or Firs send out new branches from stem and roots below those already formed, the trunk has the appearance of a bare mast for half its height or more, and if this should be broken the tree dies. Occasionally a Larch with a forked stem may be met with.

The bark of the young Larch is smooth and greenish-brown in colour, with vertical stripes of a lighter shade from half an inch to two inches deep, according to the age of the tree. These markings indicate weak places in the outermost layer of bark, which in a few years, when the inner layer develops, will yield and burst to give it place. Later on they form furrows, which deepen, while the bark



THE PARK.

becomes scaly, and bears a greater resemblance in colour to the reddish grey of the Scotch Fir, though it is usually more of a mauve hue.

THE LEAF.

The hanging branchlets are thickly studded with round knob-like brown buds. When these burst, there emerge bundles of bright yellow-green spines packed tightly together. Gradually these increase in size and spread away from one another at the tips, till they appear as a tassel of soft vivid-green, needle-like leaves, radiating from a knob, and resembling a shuttlecock in outline. This clustering of the leaves is a constant habit due to the arrested growth of the lateral branches; on the newly-formed terminal shoots the needles often grow singly instead of in bunches, and become more widely separated as the shoot lengthens. The fully-grown leaf is about an inch long. The lower branches of the Larch are often in leaf before other forest trees show any sign that their winter is past. In autumn the spines turn pale yellow, and even when fallen do not soon decay, but for a month or so reflect a golden light on to the boles of the trees round which they lie.

Although the Larch is a deciduous tree, its leaves resemble those of other cone-bearing trees in their general structure. That is to say, the leaf takes the shape of a petiole, and the fibres remain united, instead of separating one from the other to form the nerves of a leaf distinguishable from a petiole as in most deciduous trees. To the comparative development of these nerves and of the completion of the spaces between them, is due in all the cases the difference of appearance in leaf forms.

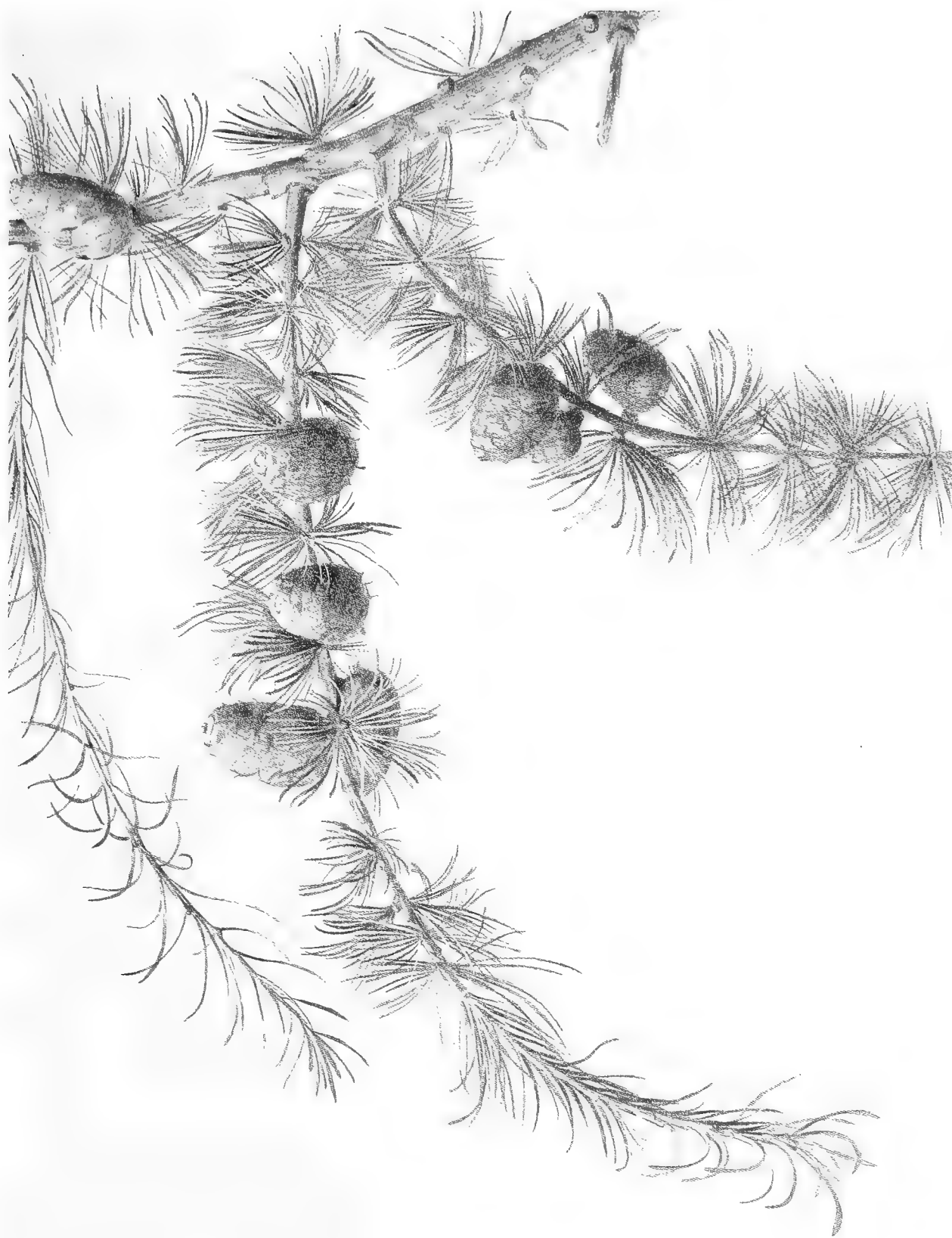
The leaves of most trees lie in a set position. On the Maples, Horse-Chestnut, the Beech and the Hornbeam they lie horizontal or somewhat drooping. It is the same with the Spanish Chestnut, Ash, Walnut, Elm, and Hazel, except that on the young vertical shoots the leaves incline upwards. The Poplars have many pendent leaves; Oak and Holly leaves are set upon the twig at rather less than a right angle, and they preserve that position in relation to it whatever direction it may take. Holly leaves turn on their stalks so as to enable each leaf-blade to obtain as much light and air as possible, but the relative positions of the main rib and the twig remain unaltered. The leaves of the Larch differ from all the foregoing in following no rule in this matter of position; they point upwards, downwards, or sideways, while sometimes each leaf of a group points in a different direction. But although conformity to a set position is the general rule, it must not be supposed that it is observed by all the leaves of a particular tree, or even by every leaf of a twig.

THE FLOWER AND CONES.

The flowers of the Larch in their general structure resemble those of the Scotch Fir. The male and female catkins grow on the same tree. The former appear in April. They are small, round, or conical in shape, and consist of a central axis hidden by tiny feathery brown scales; each scale is furnished with a pair of pollen sacks on its under side. The female catkins are more conspicuous, and there is much beauty in their waxen texture and brilliant colouring, ranging from pink and white to rich crimson. They are composed of soft overlapping scales, arranged in a spiral, upon an axis which is placed erect on a short curved pedicel. At the base of each scale on its upper side are two ovules. The ovules are "naked," not



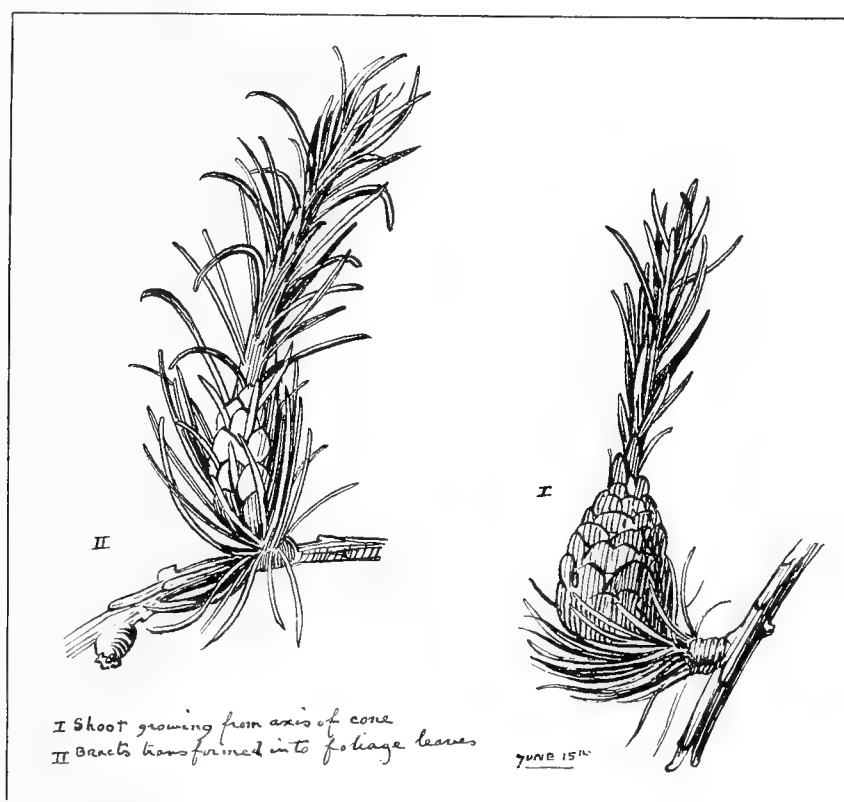
THE MALE FLOWERS.
Young Cones and Leaves.



THE CONES HALF-GROWN.
(Notice the single leaves on the
terminal shoots).

having an ovary round them. By the middle of May the scales have stiffened and the young cone appears red-green in colour, about an inch long, and surrounded at the base by a fringe of leaves. Later on the scales grow woody and brown, but are always distinguishable from those of the Scotch Fir by their being apart, instead of pressed closely together, while they are not thickened at the tip. The scales separate so as to let the seed fall out, but the empty cones remain on the tree for years. The cones mature in the course of one season.

The cones of Larches and Firs sometimes bear at their apex a shoot furnished with ordinary leaves. The leaves grow singly, not in tufts, but this is a common occurrence on long new shoots, and an illustration of it will be found in another drawing; also Fir and



Larch cones bear on the under side of each of the scales of which they are composed little bracts. These in some cases become enlarged and transformed into leaves.

THE LARCH (*Larix Europæa*).

The Larch grows rapidly, and reaches its full height (about eighty feet) in fifty years. It requires a considerable quantity of moisture, but does not thrive in the neighbourhood of stagnant water. The trees appear to have been brought to Scotland about 1629. They are lovers of light and air, and do well in exposed positions as a rule, though they are apt to become stunted and deformed if subjected to a prevailing wind from one quarter. Lightning rarely strikes them, and they can withstand a strong wind, so that, from a pictorial point of view, an uprooted Larch is suggestive of some great force of tempest.

EFFECT OF WIND.

Sometimes an old Larch that is growing near the sea coast, or in other places where it is exposed to a prevailing wind from one quarter, becomes permanently bent and contorted, and loses all its characteristics before it will give up the contest. The branches that should spread from the upright stem to all quarters, now, with one accord, strain to leeward; the branchlets that should hang free lie close to the branches in tangled tufts, hugging them on the weather side; only their tips escape the tangle, and they too, trend in the same line with the horizon and are pendent no longer. Even the upper part of the trunk is forced over and wrapt around by the smaller growth. The effect is that of a tree seen in the midst of a tempest and straining to breaking point; a stationary record of apparent movement such as an instantaneous photograph gives, curiously out of place in calm weather, and without the blurred and wavering outline of a moving form.



WIND-BLOWN LARCHES.



CORNEL FLOWER.

THE DOGWOOD (OR CORNEL).



HE Dogwood is a common hedgerow bush, and sometimes forms a tree of some fifteen feet in height.

It has certain peculiarities of growth and colouring which serve at once to identify it. The branches are arranged in pairs, each one at right angles to the pair above and below it, and are remarkable for their red colour. Both branch-fibres and leaf-ribs are unusually tough: the latter still remain united even after the leaf-blade has been torn across. There is a certain formal charm about the geometrical pattern of the florets, and the foliage tints of red and purple in the autumn are very varied.



FLOWER BUDS.

THE FLOWER AND THE BERRY.

Early in June the flowers appear. The pale green pedicle that bears them springs from the apex of the new shoot, between the bases of the uppermost pair of leaf stalks. The main pedicle bears a cluster of smaller ones at the tip, and these again are subdivided into still shorter tertiary pedicles, each one bearing a small green oval bud nearly hidden in down. At the junctions of leaf stalk and flower stalk a pair of new shoots bearing small leaves are found. The florets are not crowded together, as in the Rowan or Whitebeam, and their beauty of form is more readily seen. Four white petals,





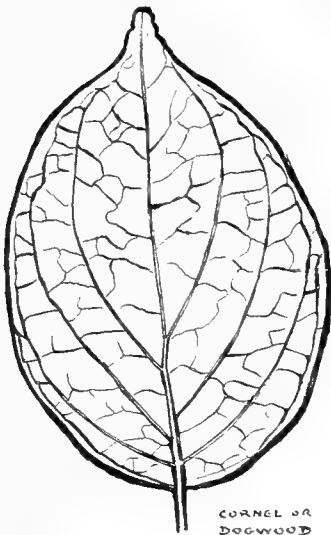
Sept 17

BERRIES OF CORNEL.

oblong and pointed, are set like a cross in one plane and at right angles to the pistil. Between each petal is a white stamen tipped with yellow, inclining slightly upwards, and springing from the yellow tinted base of the pistil; the sepals are extremely minute. By August the flowers are replaced by berries scarcely a quarter of an inch in diameter, with a dull surface. As they ripen, the pale pure green of the early stages of growth passes through shades of purple and black. The flowers have an unpleasant scent.

THE LEAVES.

In spring the pair of young leaves which terminate the shoot stand upright facing one another. Each has the blade rolled inwards from the edges to the central rib, so that the downy white of the under surface can be seen.



CORNEL OR
DOGWOOD

Below the terminal leaves are other pairs of leaves, each one at right angles to the pair above and below it. The lowest pairs reach the fullest development and measure two and a half inches in length. The leaf pedicels are set on the shoot at half a right angle, and the central rib curves backwards and downwards so that the tips of the leaves droop. When very young the leaves have a purple tint which changes later on to fresh green: the white down of the under surface also disappears, though it is still covered with little hairs. In the summer the leaf becomes rounder in shape and darker green in colour on the upper side, the underside remaining pale green. The leaf-blade does not lie flat, but is, as it were, bent upwards on either side of the central rib, so that when seen foreshortened the leaf

appears V shaped. The main and secondary ribs are very clearly marked on both upper and under surfaces ; the latter follow the outline of the leaf. The leaf stalk is about half an inch long, and, like the new shoots and the small pointed buds, purple in colour.

In the autumn the upper side of the leaf-blade passes through a scale of red and yellow tints to rich crimson, and the under side through greens and yellows to a duller red.

THE DOGWOOD OR CORNEL (*Cornus Sanguinea*).

Of the many varieties of the Cornel cultivated in gardens, the white-fruited variety, which has also branches of a brilliant red, is perhaps the most common. Another variety has large red berries. The wood of the Cornel is used for skewers. The Cornel is said not to grow in the extreme North of England or in Scotland. It is a common bush in most of the chalk and limestone districts. In Sussex and Kent there are many hedges composed of it alone. It is a good cover for game, for it can be grown beneath other trees without suffering from their drip. The distinctive forms which we have found it to possess in leafage, flower, and being, redeem it from insignificance, even when it serves such humble purposes, while in the hedgerows it shares the charm which the life of the open fields in its most ordinary aspects possess for the lover of nature.





FIELD MAPLE

THE MAPLE.

GENERAL REMARKS.—STIPULES.



WHILST leaves are still in the first stages of development, an important part in their protection is played by the stipules. In some cases their duties are brought to an end, and they fall away, as soon as the leaf has emerged from the bud. But in others they remain on the new and growing shoot, and themselves increase in size so that they may still serve as guardians to the opening leaves. These stipules have as a rule interesting and distinctive characteristics ; whether it be those of rapid growth and adaptive colour changes, as in the Sycamore ; of texture, as with the silk stipules of the young Beech ; or of form, as in those which surround the ash-bud and display at the tip a rudimentary leaf-blade. The size of the stipules on the Norway Maple and their brilliant scarlet colouring form their special claim to notice. In the Field Maple they curiously resemble the leaf itself, excepting that the part which corresponds to the leaf-stalk is of peculiar construction. Reference to the drawings and descriptions will give material for comparison between the stipule forms of different species of trees,

MAPLES.

Many varieties of Maples are cultivated. The most important are the Norway Maple (*Acer Platanoides*), the Sycamore (*Acer Pseudo-Platanus*), the Red Maple (*Acer Rubrum*), and the Silver Maple (*Acer Dasycarpum*). One Maple only besides the Sycamore grows wild—it is the *Acer Campestre*—the common or Field Maple. The Sycamore has already been treated separately. The Field Maple only is described in detail, though some drawings of the graceful flower of a cultivated Maple are given.

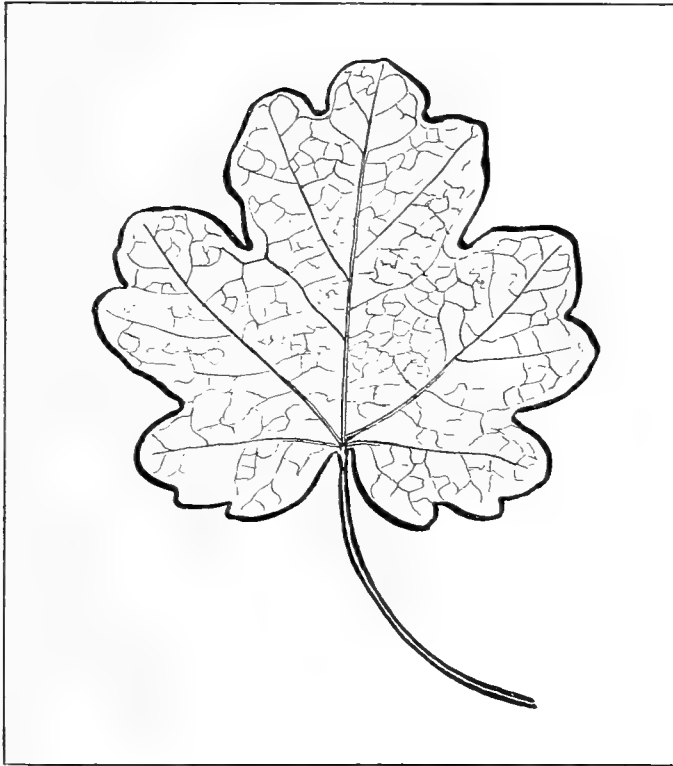
THE FIELD MAPLE.

As an indigenous bush, the Field Maple is very frequently to be found in our hedgerows: more rarely it attains the growth of a bushy tree, from thirty to forty feet in height.

The central or terminal shoot of the branch usually dies back, and growth is continued by the side-shoots, in the form of a Y, which results in very elaborate ramification. The leaves are small when compared with those of the Sycamore ("Larger Maple"), but they lie sufficiently close along the numerous branchlets as to form clusters of moderate density. The leaf buds of the Maple are also smaller, and usually greener in colour; they never approach the beauty of colour reached by many Sycamore buds. The delicate twigs and upright flower-heads of the Maple, instead of the stout shoots and heavy pendant flower racemes of the Sycamore, afford further means of identification.

LEAF, SHOOT, AND STIPULES.

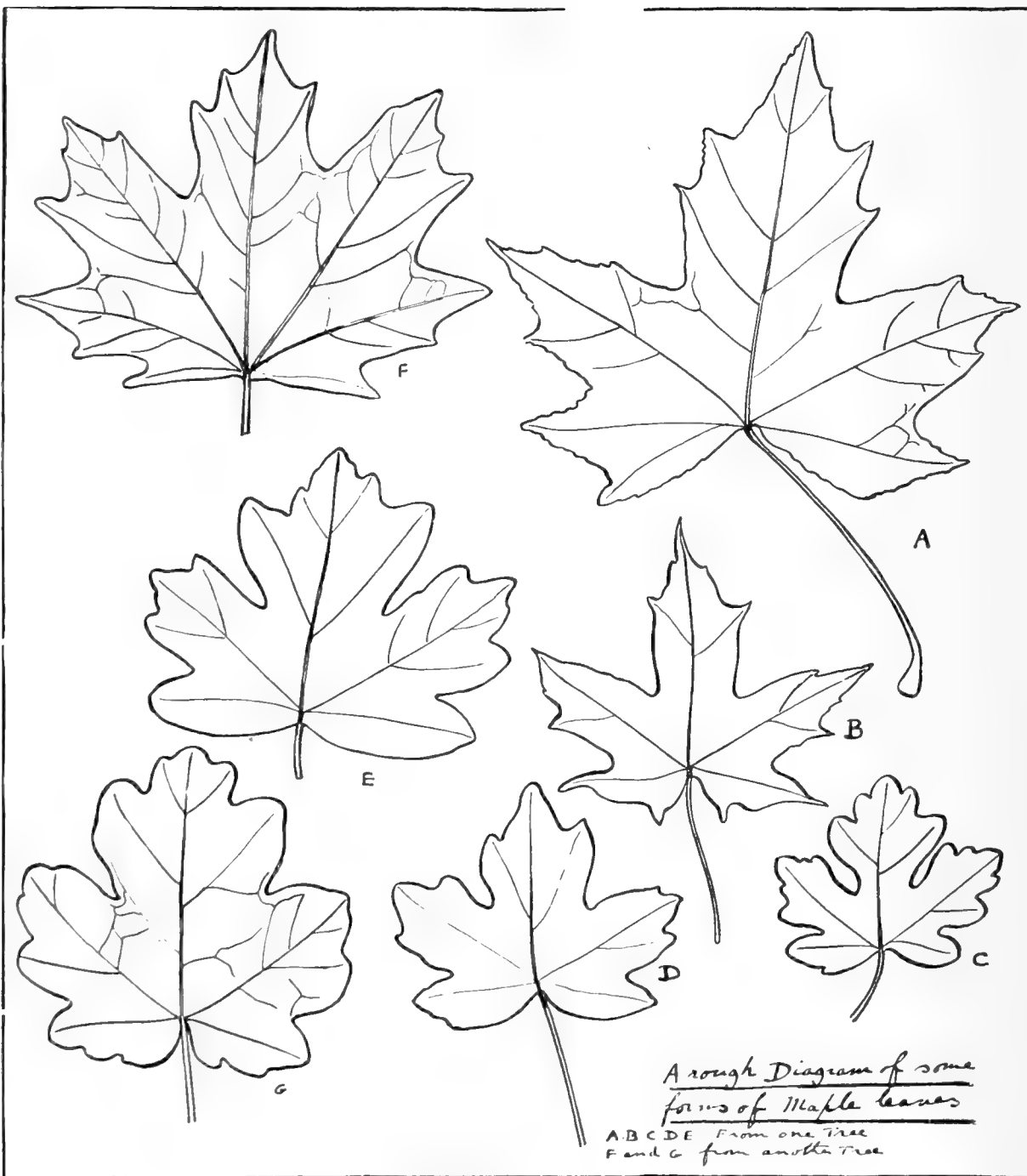
Early in April the sheath of the bud is of a dull green colour. These sheaths lengthen out, until the unopened bud is about a quarter



of an inch long, though not more than one-eighth of an inch in width. At the end of April the young shoot appears : it bears at its apex a pair of leaves pointing upwards. Only the under sides of these can be seen, tinted yellow-green or pink, and covered with white hairs, for the segments of the leaf-blades are folded together at the vertical ribs. Within this outer pair of leaves, and at their base, a

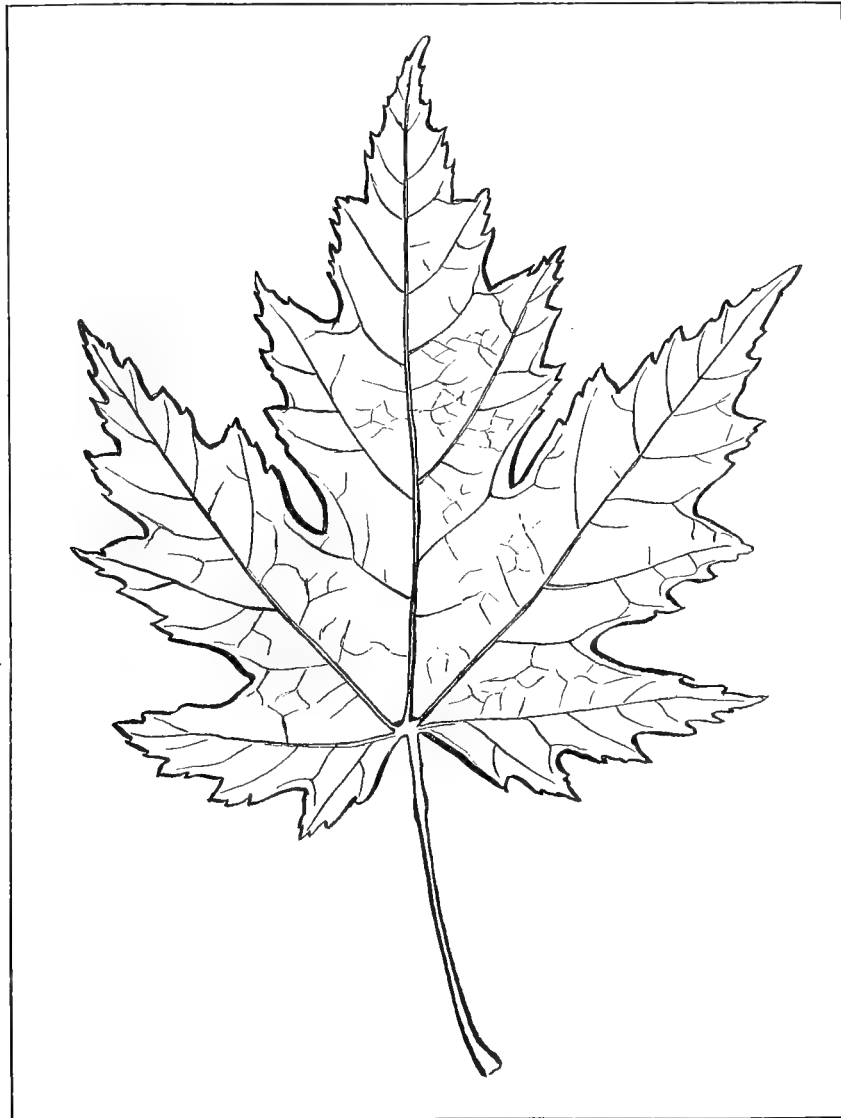
younger opposite pair are hidden away. Two rose-pink stipules, downy and pointed, appear on either side of the base of each leaf stalk. These stipules grow to three-quarters of an inch long, and curve downwards as they lengthen. The outer pair of leaves gradually take up a horizontal position, so that they lie at right angles to the inner pair, which still remain vertical. The upper surface of the leaves, while they are half developed, is, as a rule, somewhat glossy, with a tinge of red near the margin ; the under side is smooth and paler in tone.

Occasionally the young leaves are soft and downy, and their yellowish-green colour tends to become brighter with exposure : they



A rough Diagram of some
forms of Maple leaves

ABCDE From one Tree
F and G from another Tree



PLAN OF LEAF OF A CULTIVATED MAPLE.
(Compare the lobe arrangement with that of the Wild Maple.)

are supported on long green and red footstalks. The new shoot varies in colour from mealy grey to crimson.

By the middle of May the leaves are almost all fully developed, and have taken up the horizontal position they finally occupy, while the flowers are still in bud. In August the colouring of the foliage changes to a dull dark green, inclining to purple, and later in the

autumn becomes yellow. The leaves are arranged along the shoot in opposite, rectangular pairs, from three to five in number. Besides the stipules already mentioned, others are sometimes found at the base of the shoot which have leaf blades more or less perfectly formed, but are connected with the shoot by a soft flat band, like a leaf in texture, which takes the place of a leaf-stalk. These modified leaves occasionally resemble a Laburnum leaf in form.

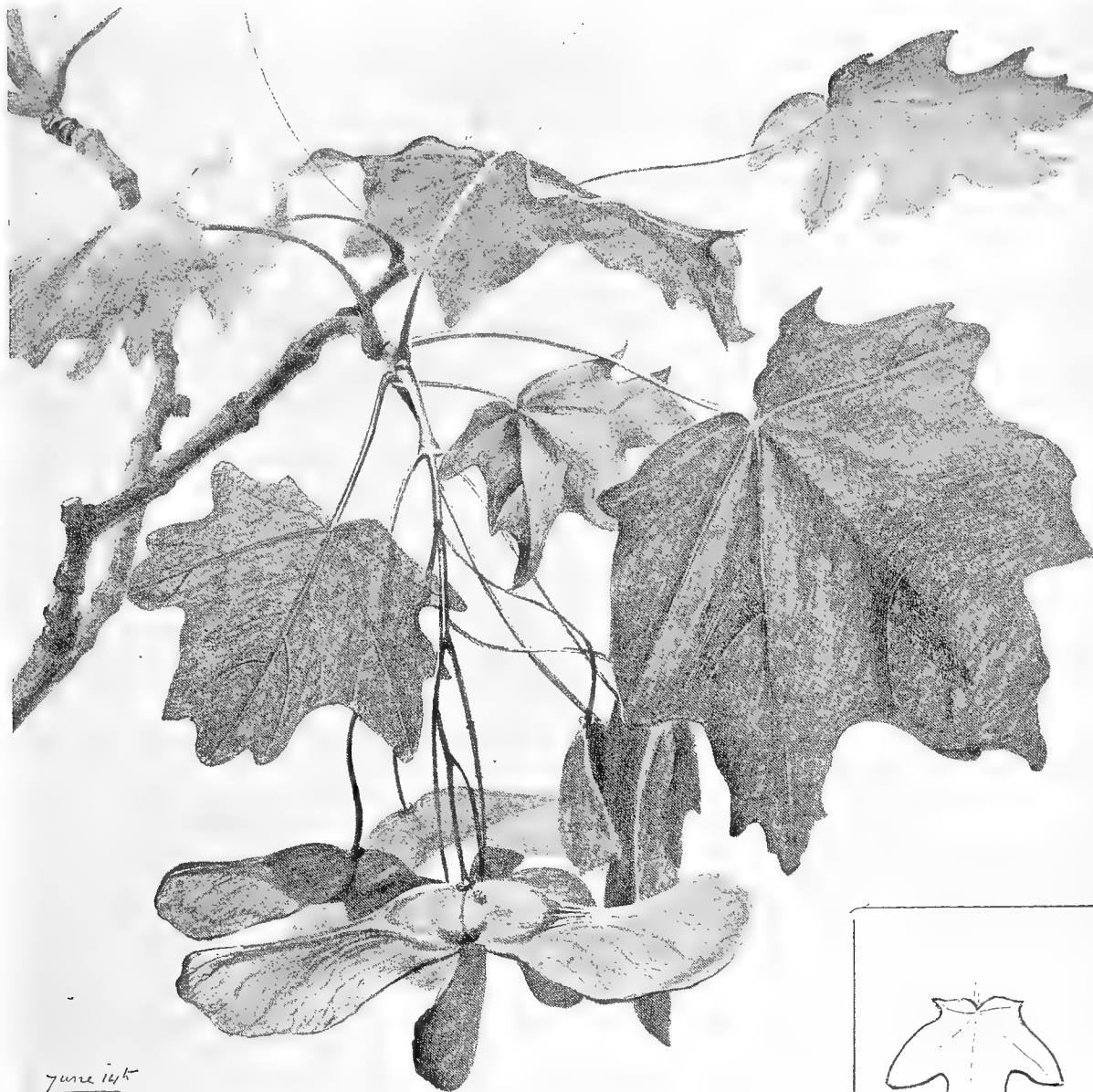
THE BARK.

The young shoots are tinted crimson or mealy grey; those of the preceding year take a yellowish-brown shade, which is the prevailing colour of the branches. The bark on the old boughs has occasionally the same cork-like texture as the bark of the Elderberry. In such cases it is deeply marked with furrows drawn lengthwise between the points from which the branches spring, and at these points is encircled by an indented ring, such as might be caused by a wire bound tightly round an expanding stem. But as a general rule the bark on the Maple trunk is distinguished by nothing more than a moderate roughness of texture.



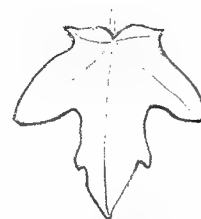
THE FRUIT.

The fruit of the Maple is constructed on the same plan as that of the Sycamore. The wings of the Maple Samara, however, spread more widely, so that they lie nearly in a line, while those of the Sycamore form a **Λ**. The base of the Maple fruit is also much flatter. The embryo plant in the seed is rolled as in the Sycamore.



June 14th

55



PATTERN OF A
YOUNG LEAF

FRUIT OF FIELD MAPLE.



FLOWER OF FIELD MAPLE.

THE FLOWERS.

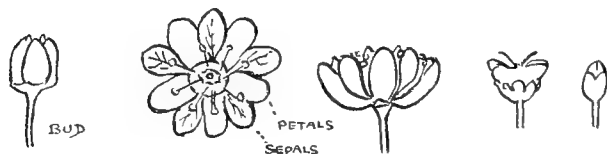
The flower-stalk grows vertically between the topmost pair of leaves, from the apex of the shoot, and in a line with it. Smaller stalks—slender and reddish-green in colour—spring from it at intervals, and still smaller ones, each supporting a floret, grow from these. The florets have five delicate green petals. Five sepals alternate with these, and resemble them so closely as to give the appearance of a second set of petals; while still in the bud they enclose and completely conceal the inner parts of the flower. The eight stamens, pale and tipped with yellow, are embedded in a round fleshy mass, in the centre of the flower, which represents the future fruit in its rudimentary stage.



FLOWERS OF A
CULTIVATED MAPLE.

CULTIVATED MAPLES.

A drawing of the exquisite flower-head of a Garden Maple is given. The growth of the raceme is less formal than that of the Field



Maple, while the single blossoms are larger. The foliage is finer, and a more geometrical exactness of out-

line is noticeable in the deep and sharply-cut lobes, whether of the single leaf or of the leaf-pairs when seen from above. Attention has already been drawn to the pattern which results in the case of



the Sycamore from a similar arrangement of the leaves in opposite rectangular pairs; and indeed the variety of design formed by the disposition of the foliage on different trees is of itself an interesting study.

The flowers of all the cultivated species of Maples are remarkable for delicacy of form or charm of colour. Maple flowers (including the Field Maple) may be distinguished from those of the Sycamore by their upright pedicle bearing separate, loosely set, florets, as compared with the hanging raceme of densely packed florets of the latter.

The leaves of some Maples in autumn are unequalled for the brilliancy of their colouring.



OPENING FLOWER BUDS.
(Cultivated Maple.)



FLOWERS—NATURAL SIZE.
(Cultivated Maple.)



THE WAYFARING TREE.

(*Viburnum Lantana*.)

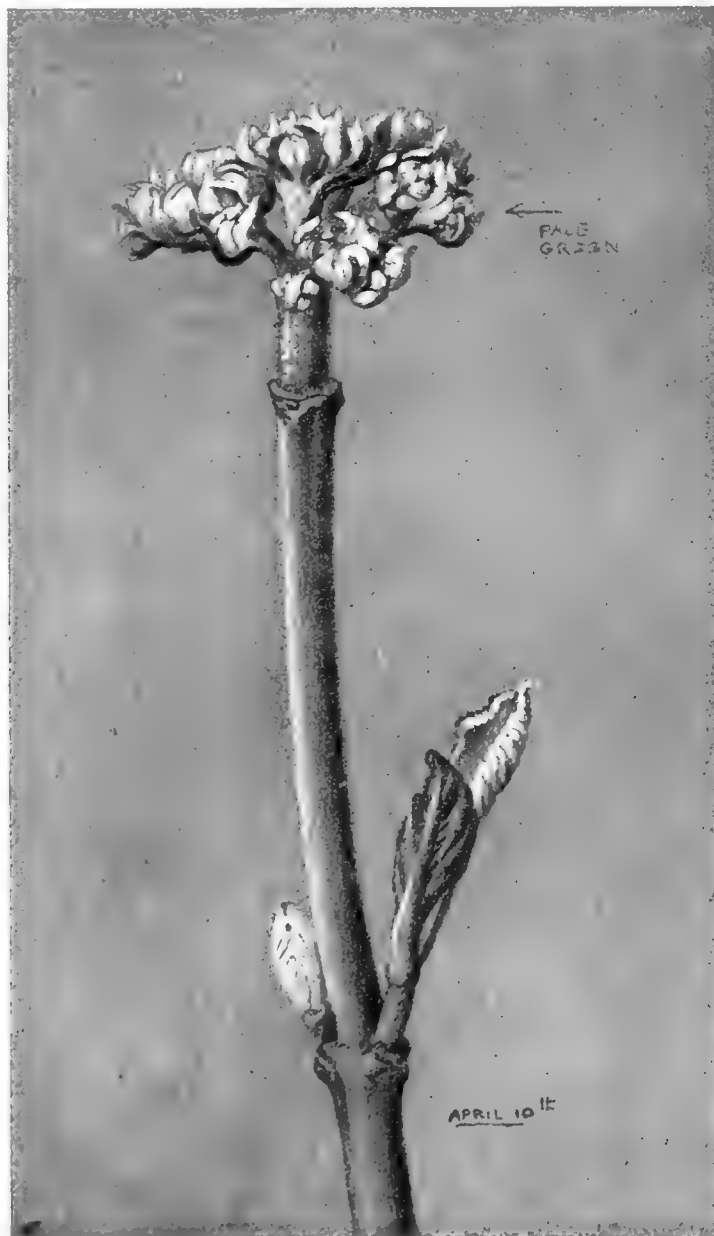


IN winter, when the monotony of bare boughs affords us fewer clues for distinguishing one tree from another, the buds of the Wayfaring Tree play an important part in its identification. Instead of the usual bud-scales, the closely packed leaves are enveloped in a coat of felt-like hairs, which answer the same purpose, and is far more conspicuous. The unusual form of the buds is shown in the drawing. In the summer time the most prominent features of the tree are the hairy roughness of the coarse puckered leaves and dusty-looking young shoots, and the flat form of the oval berries while they are young.

The branch system of the Wayfaring Tree follows in the main that of the Guelder Rose, to which it is closely allied, but is without its eccentricity. The leaves of the two trees bear no resemblance to one another, neither do the flower-buds of the Wayfaring Tree produce

THE WAYFARING TREE.

anything like the outer circle of large barren flowers so familiar in the Guelder Rose. The Wayfaring Tree rarely exceeds a height of six to ten feet, and is common in the hedgerows of the chalk district.



OPENING FLOWER BUD.



FLOWER.



BERRIES.

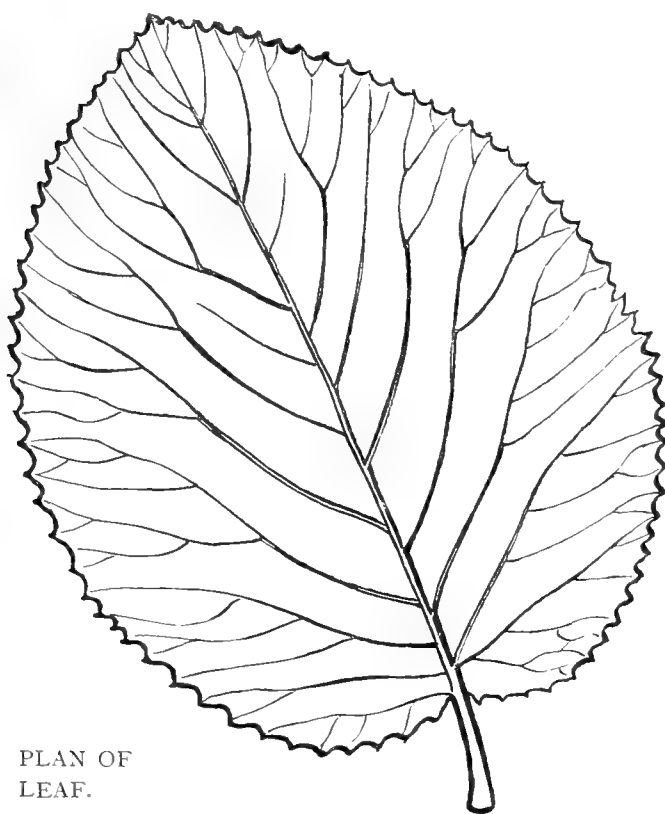
THE BRANCHES.

The buds are found in pairs, one opposite the other, and each pair at right angles to the one above or below it on the shoot. The terminal bud conceals a flower-cyme, and the shoot is continued by means of the lateral buds. One is set on either side of the dead flower-stalk, and in this way a fork of three prongs is produced (V). Each lateral shoot is in its turn prolonged in a similar manner, (Y), only varied by the occasional loss of one arm of the fork (f). The old wood is a dull purple or red-brown colour. The new shoots are hoary.

THE LEAF.

Towards the end of May the leaves expand. The young ones resemble a scroll set upright: they are rolled up from the edge to

the central rib displaying only the back of the blade, which is hairy and a greenish-white colour.



PLAN OF
LEAF.

The leaves grow in decussate pairs and are borne on rather short petioles, so that they form on the shoots, which are also short, a rosette made up of two large and well-developed leaves and two small and younger leaves arranged crosswise. In the centre of the rosette stands the upright bud. The leaves

when mature measure some three inches in length. They lie horizontally, and are clearly marked by the indentations of the main rib, and of the forked secondary ribs, between which the leaf-blade is evenly puckered. The ribs greater and less project considerably on the under side of the leaf. In summer the foliage looks dusty, dull in colour, and coarse, and feels rough to the touch, but autumn brings to it gorgeous tints of crimson and red.

THE FLOWER.

When the leaves are well out the flower makes a brave show. The flower cymes are in the shape of a horizontal disc slightly domed, and



about three inches in diameter. They are produced at the apex of the shoot, and consist of many small florets packed closely together. Each

floret has a cup-shaped corolla tube, the five white lobes of which look like petals bent backwards. Between the pale green centre and the indentations of the lobes are white stamens tipped with yellow. The flower-stalks radiate from a common centre and branch off three times, each time diminishing in length and girth, before the florets appear at their extremities. The dead stalks of last year's flowering are still to be found in the forks of the lower branches.

THE BERRY.

The florets are succeeded by oval green berries, curiously flattened, and tinged at the tip with the same reddish-brown that colours the pedicels. The berries become less flat as the year goes on, and pass through the whole range of colours, from green by pale yellow and rose-red to scarlet, before finally becoming black and ripe. They are glossy and smooth to the touch.

THE SCOTCH FIR.



SCOTS PINE.

"THE END OF THE TIDE AT EBB."
(LIX: Royal Academy, 1902.)



SCOTCH FIR (PINE).

GENERAL REMARKS.



DIGNITY — grandeur — a majestic stillness : these are the characteristics of a grove of pine trees. And grave as they are, and full of sombre shadows, they seem, of all moments in the day, to have most in keeping with the moment of sunset. Linger for a time at the foot of this sandbank,

and look from the rosy streak that still lies across the heather to the dusky canopy above your head. Rays of red and gold lend a glory to the upper boughs, but their shadows fall, sharp and clear-cut, on the stem of the tree. Against a background of bright clouds gathered on the horizon, the trunk rises like a grey pillar, nobly poised. Behind and above it is a mass of foliage, all in purple shadow, except where the sky breaks in upon the outer fringe; the nearer branches that lie across it hold the sunlight in their ridges. Below the main group of foliage a few broken boughs with ragged ends, jut out forlornly. In a hollow close at hand are the stumps of trees already felled, with cushions of yellow moss and gaudy funguses clustering about the roots. Where the living trees stand in close order the ground is thickly strewn with pine-needles all dried to brown and grey, except where a rabbit scuttling through has turned up the damp red leaf-mould underlying the surface. A squirrel has fled from his feast upon the cone-seeds and left heaps of broken husks behind. Stay a little longer—the glow of enchantment is passing: the bank of cloud has grown from bright to dull, and spared no radiance to the trees. The rattle of a night-jar sounds sharply through the branches; afterwards their soft soughing alone disturbs the stillness. The night air is full of a resinous scent. Darkness reigns in the Pine wood.

FIRS AND PINES.

The tree commonly known as the Scotch Fir belongs to the family of the Pines. Some very striking characteristics separate the conifers from other trees, and well marked habits of growth differentiate the Firs from the rest of their tribe.







OUTLINE. All the Pines and Firs when young are to be distinguished from deciduous trees by their conical outline and the regular disposition of the branches on the trunk. In some species this formal arrangement of the branch-system is lost after a time, and a new plan takes its place. In other cases the characteristics of the young tree are more or less retained in maturity.

With age the Firs and Larches shed all their lower boughs until the apex of the spire alone remains. The Pines also lose their lower boughs, but from the upper trunk lateral branches grow out. They are arranged on a new plan, and form a tuft on the crest of the main stem, which has long since reached its full height.

TRUNKS. The trunks in both species contrast with those of deciduous trees. They are lofty, small in girth for their height, cylindrical, tapering and upright. The branches they bear are relatively short, and follow certain systems of ramification, which are elsewhere described in detail.

LEAVES. The leaves of nearly all the conifers are remarkable for their lack of lateral expansion, and, in spite of this, for their great variety of form. The leaves of the Spruce (Fir tribe) are needle-shaped and angular, those of the Silver Fir and the Yew are flat, while those of the Scots and Austrian Pines have one side convex and the other flat. The species vary between a blunt leaf and one sharply pointed: Yew leaves, amongst others, are curved, Larch leaves are straight, and there is a difference of four inches in length between the miniature spines of the Cedar (one inch) and the long needles of the Stone Pines (five to six inches). There is no less variety in colouring, though a dark green finds most favour: the foliage on some trees is glaucous in its early stages only, on others it never

loses its gloss. The Yew has one side polished, the Scots Pine a dull leaf, while the Silver Fir owes its name to a shimmer on the underside of the leaves. The margins are usually smooth, but in the case of the Austrian Pine they are rough. Nearly all the leaves are strongly scented. Nor does the arrangement on the twig show less diversity than the foregoing. The Pines have their "needles" bound together in bundles of two, three, or five,* by a sheath at the base, and the bundles are arranged spirally around the twig. The Firs bear their leaves singly, and arranged either in rows down the stem (Silver Fir two or three rows, Yew two rows, Douglas Fir three or four rows), or in spiral order round it (Spruce). The Larch bears its leaves in tufts.

FLOWERS. The flowers of conifers are very simple, but the profusion of the pollen and its bright colouring make them conspicuous, though petal and sepals alike are missing.

RAMIFICATION OF THE BRANCHES.

Some explanations have already been given to account for the marked difference in form that exists between young and old trees of the same species. In one class the variations may be due to the increased prominence in maturity of features which already characterised the young tree; in another, to the modification of those features by unequal growth, or repeated failure to bring all parts to perfection.

In an old Fir hardly any of the special characteristics of the young tree are to be traced. The young Fir consists of an upright stem terminating in a long shoot of vigorous growth. From points round the stem straight branches radiate, which each in turn

* Scots, Austrian and Stone Pines two.

bear at the tip a new shoot inclining upwards. These branches are arranged in tiers; the lowest grows at right angles to the stem, and each succeeding one in the upward ascent takes a more acute angle and is somewhat less spreading than the last, till the summit of the tree is reached, where a leafy shoot surmounts the whole. The decrease from the tip of the lowest bough to the topmost whorl is graduated with perfect regularity, so that the tree is shaped like a cone of dense formation with a sharply-pointed apex. The same tree when old has a massive trunk, destitute of branches for three quarters of its height. The boughs themselves are curiously curved; they spread in every direction and are often pendent. The tapering spire has given place to a flat canopy of dense foliage and matted twigs. Instead of the gracefulness of youth the tree has acquired something of the grandeur of old age.

The paucity of branches is principally due to two causes. In the first place, the lower branches become decayed as the tree advances in age, and fall away, leaving only stumps or scars behind them. But the tree, once fully grown, can put out no new boughs in or below the places of those it may have lost. In this respect it differs from the Elm, Poplar, and many other trees, where the trunk after lopping is soon covered with adventitious shoots. In the second place, the twigs bear an unusually small number of buds in comparison with other trees. The leaves are abundant, and arranged closely together to form a spiral line round the twig, but perhaps not more than two or three of them in succession will be found to bear a bud in the axil.

We have thus an arrangement of two or three buds together, clustered, slightly one above the other, round the shoot, with a considerable interval, occupied only by leaves, before the next cluster

can be discerned; these recurrent intervals will sufficiently account for the apparent growth of the branches from points on a circle drawn round the trunk, though our study of an earlier stage has shown them actually to be produced at points on a spiral.

In older trees many of the branches die for want of light and air, and their arrangement in clusters is destroyed. Another distinctive

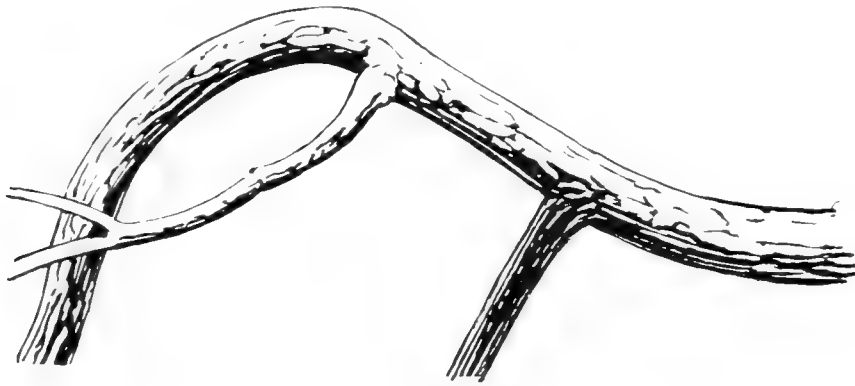
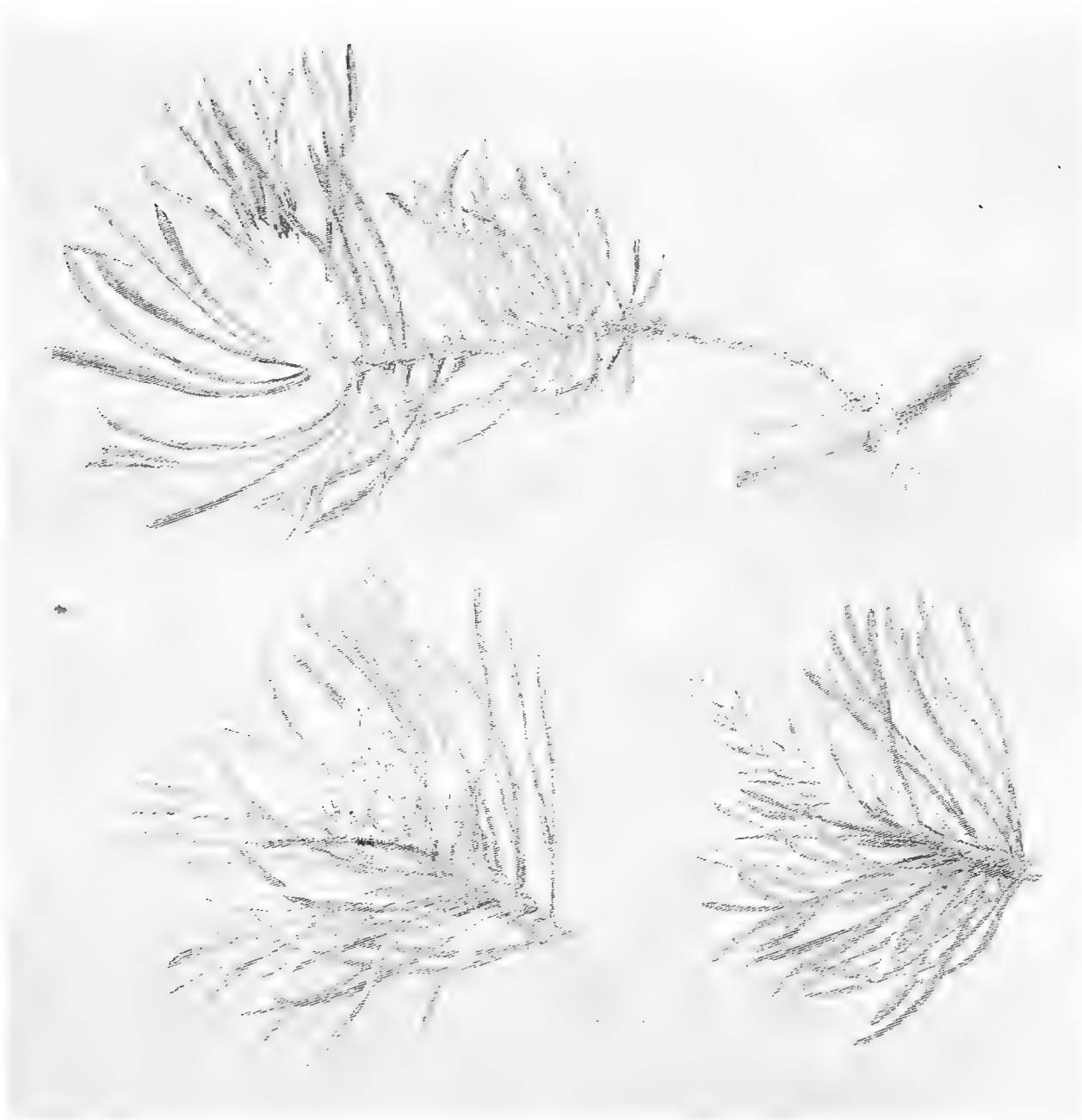


DIAGRAM OF THE CHARACTERISTIC
CURVES AND ANGLES.

feature of the tree is the construction of the branches in long slightly curved lines, which break suddenly up or down into sharper curves, often several times repeated, sometimes straightened out, or again bent into a decided angle. Age alone is responsible for these strange deviations, but their cause may be ascertained by a study of the development of the young shoot. It first appears at the extremity of the branch, pointing upwards to the light. During the first season it bears cones and leaves at its apex, and is bent into a downward curve by their unwonted weight. New upright shoots are successively formed, and under the growing burden of its fruitage the bough becomes gradually pendent, though it curves less sharply in its stubborn



TERMINAL BUD.

MALE FLOWER.

THE NEW SHOOT.

THE NEW GROWTH
OF A SCOTS PINE.

maturity than did the slender twig. The side shoots are meanwhile following a like course in their respective directions. The characteristic ramification of the old tree thus partly results from the peculiar suppleness of the young twig as compared with that of other trees.

DEVELOPMENT OF THE SHOOT AND LEAVES.

In autumn the twig usually bears at its extremity a cluster of three buds, though occasionally but a single one is found. These buds are red-brown in colour, sharply pointed and smeared with a white, resinous substance. By the following May the new shoot has begun to grow, and at its apex the tips of the leaves, covered by red-brown sheaths, form a compact cylindrical mass. By the end of the month the colour of the shoot has changed to a brilliant shining green, and its length has increased to two or even four inches. As it lengthens the leaves disengage themselves one by one and spread outwards; the brown sheath which has protected them during the winter still enwraps them at their base, but it is folded back from the point to allow its nurslings room to expand, and the young leaflets push their bright green tips through the inner covering of silky white skin.

The base of the shoot is still concealed by the sheaths and the long needle-like leaves of previous seasons. When the shoot is fully grown it is thickly covered with leaves, springing in pairs from the stem. These needles are from two to three inches long, regularly about one-sixteenth of an inch wide, and sharply pointed. Each pair is bound together at the base by a brownish-grey filmy tissue which is nearly transparent; the arrangement of the surfaces, which are flat

on the inner side and convex on the outer side of each leaf, enables them to fit very closely together at this point.

The sheath or ligament shrivels away before the four years have expired, during which the leaves usually remain on the branches. The lineal veins are clearly marked on the inner surface of the leaf from tip to base. The leaves are set on the twig at about half a right angle; they curve towards it, and are twisted on their axils. Round the apex of the twig they grow so closely as to form a sort of cup or hollow, at the bottom of which nestle the newly-formed buds and the cones; on the lower parts of the branches they are thinned out by wind and weather.

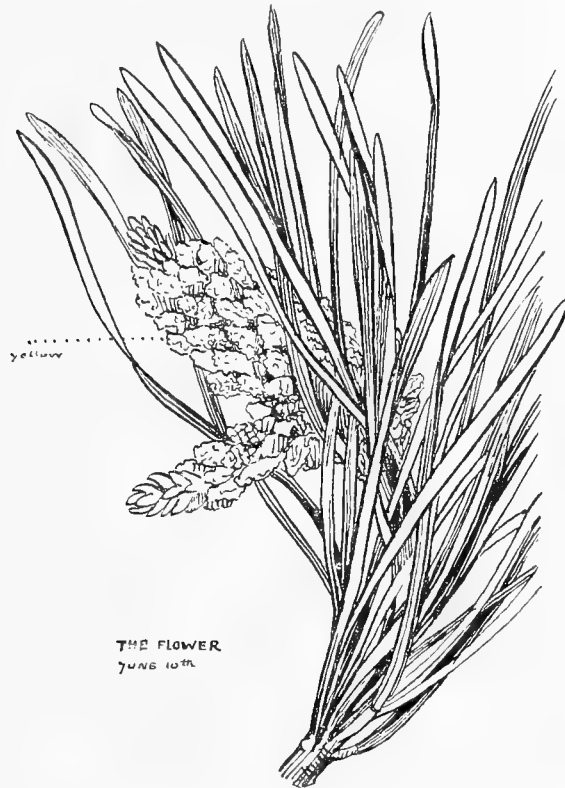
The colour of the leaves varies both in individual trees and in the members of different groups. In the new needles the green is pale, glaucous, and tinged with grey; in the older ones dark and shining. In some varieties the foliage when seen from above appears almost blue in tone, and in others it is sea-green. On young trees the leaves are considerably larger than on those at a more advanced stage; they remain on the trees from three to four years, and the rapid growth of the shoots which bear them (which become during that period stems and stout branches) results in their being set widely apart.

PINE SEEDLING.

The seed leaves of the Scots Pine, contrary to the general rule, show a marked resemblance to the true leaves that follow. They are of nearly the same shape, and arranged in a bundle. They radiate from the stem after the fashion of a vase, and in their arrangement resemble the true leaves growing on some of the dwarfed branchlets.

MALE FLOWERS.

Male and female "flowers" are produced on the same tree. The male flowers are massed together in erect ovoid cones (the anther lobes



THE MALE FLOWER.

containing the pollen) about a quarter of an inch long, closely arranged in spiral rows round a stout green spike, and forming a dense cluster from one to three inches long. From the apex of this cluster projects the terminal bud. These "flower" bearing spikes vary from one to three in number, and spring from the extremity of the last year's shoot. Each separate floret of the cone consists of a scale, to which is attached a pair of pollen sacs, and is furnished at its base with long narrow bright brown scales, and at the base of the main spike are

several layers of such scales curling back from the tips. The flowers are produced in May; at first a dull red they change to sulphur-yellow when the pollen is ripe. This is sometimes produced in such profusion that when the anther lobes burst, and it is scattered, the ground beneath the tree is tinted yellow. It is carried by the wind directly on to the naked ovule of the female flower without the aid of insects.

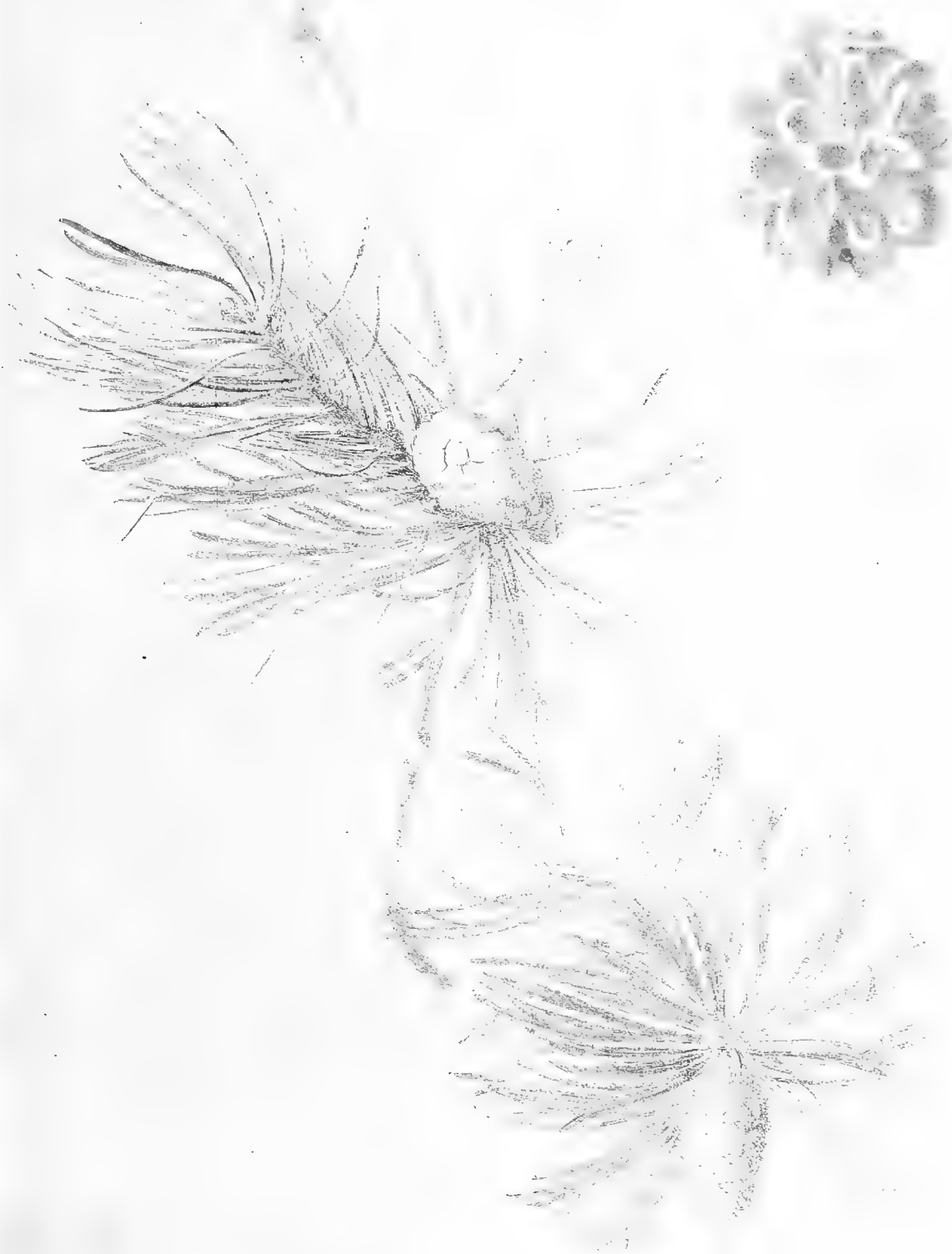
FEMALE "FLOWERS."

The Female Flowers are grouped in cones also situated just below the terminal bud of the shoot, and vary in number from one to three. At first they are inconspicuous club-shaped bodies standing upright, and surrounded at the base by the tips of the young leaves. By the autumn the short greenish-brown pedicels that support the cones become long enough to allow of their hanging down on either side of the terminal bud. The cones are now hard and brown, but not more than a quarter of an inch long. The scales of the cones are already tipped with the raised diamond shaped bosses, arranged in spiral lines, which form so characteristic a feature of the mature cone. In the following year the cone no longer appears at the extremity of the bough, for a new shoot has been formed beyond it.



THE YOUNG CONES.

It is now an inch in length, tapering to a point, and of a dark and brilliant green; the scales are tightly closed together, and the pedicel is brown and scaly. In the third year the cone itself becomes brown, and the scales open out to allow the tiny winged seeds to escape, and remain attached only at their bases. There is a light brown patch at the base of each scale where it has been protected. The exposed parts have become grey and woody. The cones remain on the trees till the end of the year, after parting with their seeds.



BRANCH WITH CONES (Reduced).

STRUCTURE OF THE CONE.

The female flowers have a central axis. Round it are arranged, in spiral order, overlapping woody scales, closely pressed together. At the base of each scale on its inner surface are a pair of "naked" inverse ovules. Attached just below each seed-bearing scale is an inconspicuous bract.

THE BARK.

The bark on the trunk is reddish brown and scaly, on the branches more yellow in tone: in the old trees there is an outer layer of bark, grey and deeply furrowed on the lower part of the trunk, which often becomes stripped off in patches. The twigs are fawn grey in colour; the under and less weather-beaten surface has a glossy freshness which the upper side lacks. The surface of the newly-formed twigs is roughened by the projections which mark the bases of the leaves now fallen away; on larger twigs these projections appear only as scars encircling them in spiral lines.



SCOTCH FIR (PINE).—*Pinus Sylvestris*.

The Scots Pine is a native of Great Britain. It will grow in any soil, whether wet or dry, and whether consisting of sand, peat, or loam. On exposed moorland it dwindles to a dwarf tree supported



by numerous lateral roots ; in deep soil it sends down a main root, and the trunk under favourable circumstances attains to a height of one hundred feet. The Timber is coarse, stringy, and resinous ; its quality is dependent upon the nature of the soil in which it is grown.

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